

AMERICAN JOURNAL OF OPHTHALMOLOGY

SERIES 3 VOLUME 22

1939

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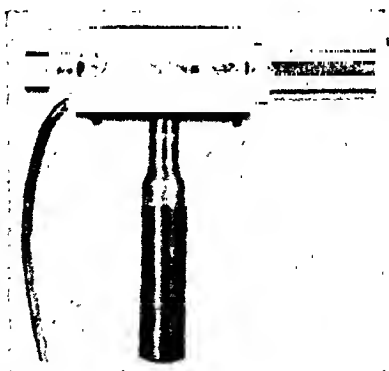
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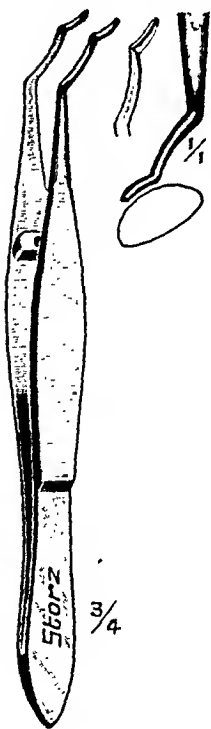
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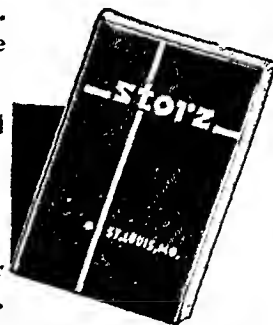
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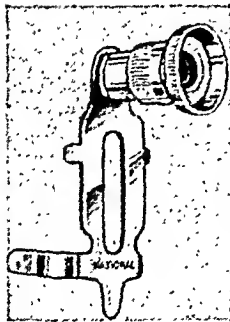
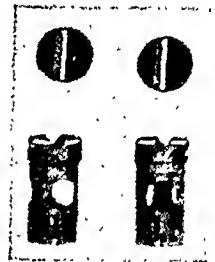
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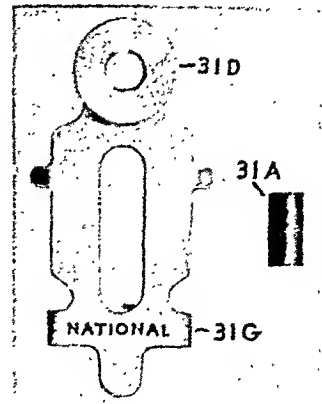
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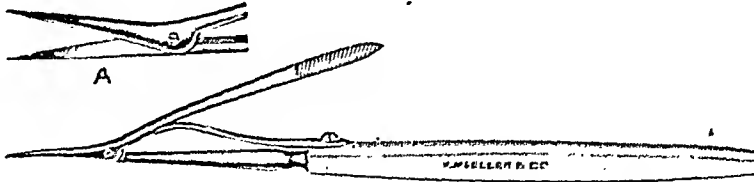
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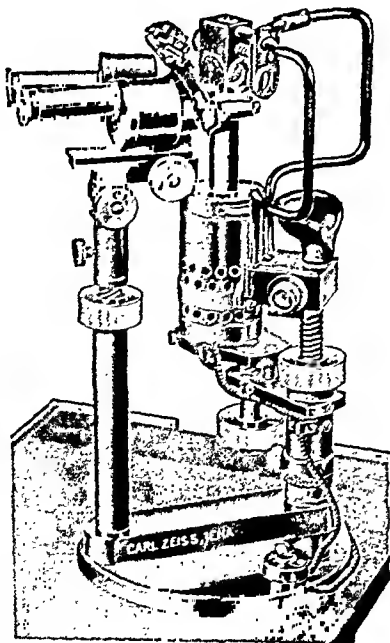
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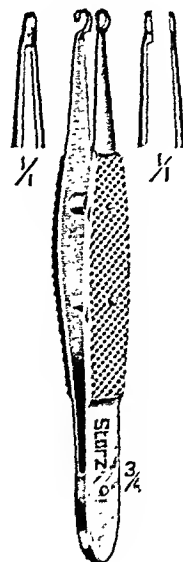
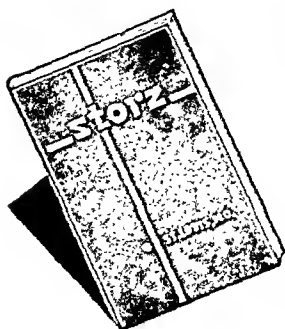
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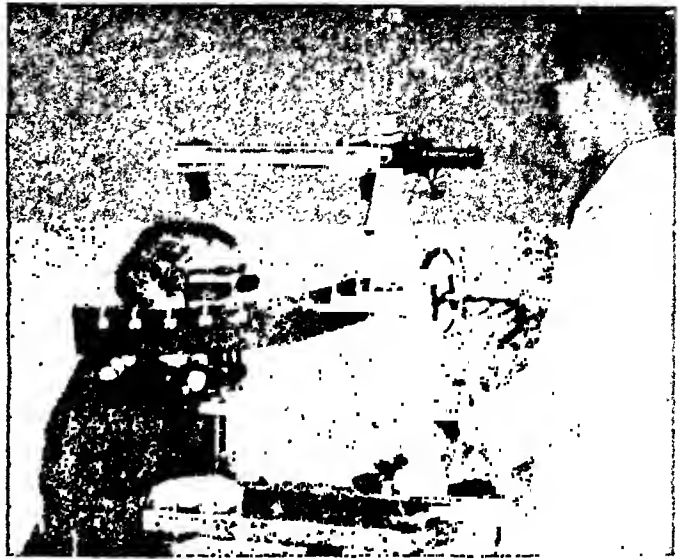
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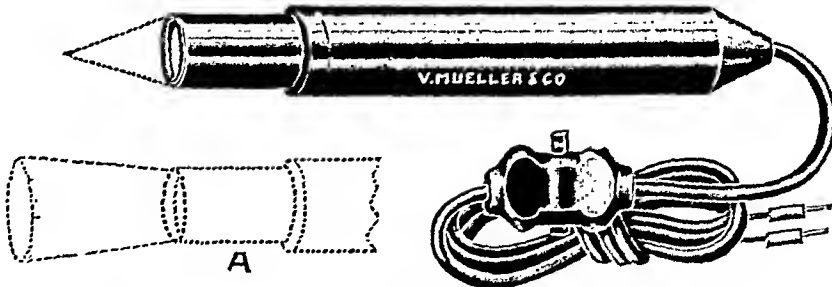
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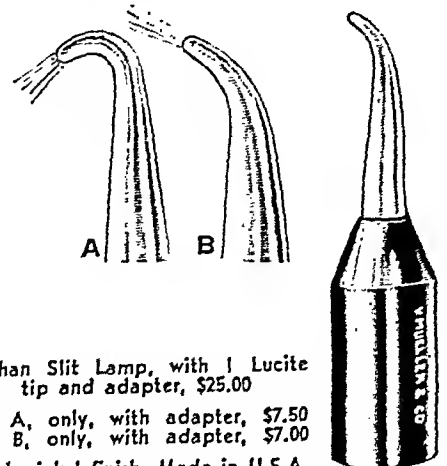
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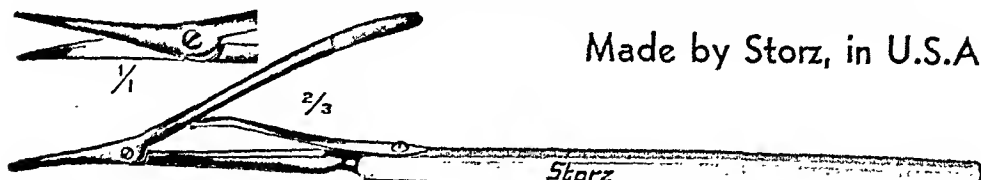
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FACIAL HEMIATROPHY*

A REPORT OF TWO CASES

FRANK B. WALSH, M.D.

Baltimore, Maryland

Facial hemiatrophy deserves mention in current ophthalmological literature because ocular changes, although usually inconspicuous, may be observed. The purpose of this paper is to report two cases and to indicate the present state of knowledge on the subject.

There are two important types of the disease: the congenital nonprogressive, and the more frequent progressive facial hemiatrophy. Congenital facial hemiatrophy has been recorded rarely. It is characterized by congenital hypoplasia with subsequent retardation of growth (Wartenberg¹). Case 1 here reported presented a classical picture of this abnormality.

CASE 1

I. G. (104, 047), a white boy, age 13 years, was examined in the dispensary clinic of the Johns Hopkins Hospital in March, 1937. He complained of poor vision in the right eye noticed three months before his visit to the dispensary. The right side of his face has been flatter than the left since birth.

He was the fifth of seven children, all of whom were normal except the patient. His birth was normal. His mother noticed immediately that his right cheek was

yellow and covered with fine hair and appeared flatter than the left. The upper right gum became swollen and sore at seven years of age, but no teeth had appeared. The unerupted deciduous teeth were later extracted.

Examination showed a facial asymmetry, the right side of the face being much flatter than the left. On the right side there was much lanuginous hair with atrophy of the muscles and wrinkling of the skin. The right outer canthus was displaced downwards. There was no motor paralysis nor sensory change in the involved region.

Examination of the right eye showed the lids, lacrimal apparatus, conjunctiva, cornea, anterior chamber, iris, tension, and external ocular movements to be normal. The pupil was round, regular, and reacted to light and on convergence, and was of the same size as that of the left eye. There was no enophthalmos. Ophthalmoscopic examination showed a large central pigmented chorioretinal lesion which involved the macula. The remainder of the fundus was normal. The left eye was normal throughout. Vision in the right eye was 10/200, in the left 20/15.

Roentgenograms showed that permanent teeth were present in the upper right gum. None had erupted. The frontal and maxillary sinuses and the basal foramina were smaller on the right than on the left. Figure 1 illustrates the appearance

*From the Wilmer Ophthalmological Institute of the Johns Hopkins Hospital and University. Read before the Section on Ophthalmology, Baltimore City Medical Society, February 24, 1938.

of the patient at the time of admission.

Progressive facial hemiatrophy is not an extreme rarity. J. Purves Stewart² described the disease as follows: "This disease, which commences in early life, usually before puberty, and more often in females than in males, shows itself first in the skin of the face, either near the orbit or over the upper or lower jaw, gradu-

Progressive facial hemiatrophy has been observed as an accompaniment of scleroderma so frequently that it is considered by some authorities to be a definite form of that disease. Syringomyelia may result in either hemiatrophy or hemihypertrophy. Hemiatrophy has been reported as following epidemic encephalitis (Mankowski³). It has followed Klump-



Fig. 1 (Walsh). Congenital (nonprogressive) facial hemiatrophy. Case 1.

ally spreading over the whole face on one side. The skin becomes thinned from atrophy of the papillary layer, the subcutaneous fat disappears, and thus the affected side of the face becomes wrinkled and furrowed in marked contrast with the healthy side. Later the subjacent muscles, cartilages, and bones become atrophied, but without motor paralysis or reaction of degeneration. The corresponding side of the tongue, when protruded, comes straight out, unlike that of a patient with atrophy from hypoglossal palsy. The hair on the affected side may fall out or become white, and the sebaceous glands may atrophy. The scalp rarely is affected. There is no anesthesia." This concise description suffices for many classical cases, but others are recorded in which more complicated pictures were present.

ke's paralysis and infantile hemiplegia, but with these conditions this paper is not concerned.

Associated symptoms and signs have been: (1) contracture of muscles of the affected side of the face. Sachs's⁴ patient exhibited clonic then tonic spasms of the temporal and masseter muscles which spread to the tongue on the atrophic side. Convulsive tic was noted by Oppenheim,⁵ and intention tremor of the upper extremity on the same side by Claude.⁶ (2) Hemicrania was observed by Oppenheim. (3) Jacksonian epilepsy has been observed in many cases (Wartenberg,¹ Wolff⁷). Calcification of the brain and epilepsy were recorded by Merritt, Faber, and Bruch.⁸ These cases have some weight in pointing to a possible cerebral focus as the causative agent in the condition. (4) Recurrent herpes was

observed by Trotter.⁹ (5) Tachycardia was noted by Jendrassik.¹⁰ (6) Esophageal dilatation was recorded by Claude and Cantraine.¹¹ (7) Shumway¹² has reported the case of a patient who exhibited facial paralysis, optic neuritis, and facial hemiatrophy on a basis of polyneuritis. Facial hemiatrophy also has been observed with facial paralysis (Wartenberg¹), but Gower¹³ is authority that true facial hemiatrophy never results from facial paralysis. (8) Acromegaly was observed by Harbitz.^{13a} (9) Pigmentation of the skin has been observed frequently. (10) Ocular changes have been noted frequently and are described separately.

Obviously progressive facial hemiatrophy is a misnomer when the process involves other parts of the body. It may commence in the upper triangle of the neck (O. Fischer¹⁴). The shoulder girdle on the same side of the body as the affected face, or the whole of one side of the body may be involved in the process (Oppenheim,⁵ Finesilver and Rosow¹⁵). The face on one side may atrophy with a coincident atrophy of the trunk and limbs on the opposite side (Lunz,¹⁶ Bernstein¹⁷), or a facial hemiatrophy may occur in association with pigmentation on the opposite side of the body (Volhard¹⁸). Bilateral hemiatrophy (Schlesinger) occurs not infrequently (Archambault and Fromm²⁰).

Case 2 here reported is an example of progressive facial hemiatrophy, and is especially interesting in that the patient suffered from heart block, a complication hitherto unreported in facial hemiatrophy. Only the essential details of this case are presented.

CASE 2

L. C. (H.L.H. 72,374), a white girl, was first seen in June, 1931, at which time she was five years old. She was

brought for admission because of a difference in the two sides of her face.

Past history: She was the third child of the family, having two brothers who were two and four years older, respectively. Both siblings developed normally. The parents were healthy without developmental defect. During her fifth year she contracted measles, chickenpox, and influenza. One month before examination in this hospital she had whooping cough. One year before her examination here she had been hospitalized elsewhere, at which time a diagnosis of heart block was made. She recovered from this after a few months. The cause was not ascertained.

Present illness: At the age of three years her mother noticed a bluish tint in the skin at the left corner of her mouth. Two or three months later it was observed that the left lip had become thinner than the right and was drawn outward. About this time a hollow above the left upper eyelid appeared. The whole left side of the face gradually became smaller than the right side. There was no complaint of twitchings of the facial muscles, of pain, or of abnormal sensations in the affected area. There was no visual defect.

Examination (June, 1931), age five years: The patient was a rather frail child with no complaints, with normal temperature and fast pulse (130). General physical examination revealed no abnormality other than that of the face.

The head was of normal shape and size. The face was asymmetrical. Above the left eye the forehead contour showed a large shallow depression about 3 cm. in diameter. The outline of this depression was definite and its walls sloped gradually inward. The face showed thinning of the upper lip on the side with thinning of the buccal mucosa. There was an indistinct line of pallor and atrophy 0.5 cm. wide

extending upward, just lateral to the left side of the nose and medial to the inner canthus of the left eye and merging with the atrophic area on the forehead. The veins of the left side of the face were not dilated. Over this area the skin was thin and freely movable over the underlying structures. The color of the skin was unchanged, but tiny dimpled areas

higher on the affected side than on the normal side. Subsequently this difference was not found.

A diagnosis of facial hemiatrophy was made.

Second admission (1933), age seven years: The facial atrophy appeared more advanced. In addition, there was an abnormally slow pulse rate of 44. An ad-



Fig. 2 (Walsh). Progressive facial hemiatrophy. Patient in case 2 at five and eight years of age.

were present in it over the involved areas. Palpation gave the impression that there was thinning of the underlying structures.

The eyes appeared to be normal, with pupils, equal in size, which reacted normally to light and on convergence. External ocular movements were normal. The ophthalmoscopic examination was negative, bilaterally.

Laboratory tests, including Wassermann reaction on the blood, were negative. Roentgenograms showed clouding of the left antrum.

Special tests: On this admission it was thought that the electrical resistance and the temperature of the skin were slightly

ditional change in the face was thinning of the soft palate on the left. The left maxilla had become much wasted. The nasal bones on the left side were smaller than those on the right. The upper left gum was thickened and the teeth in that region were irregular. The mandible and the tongue were not affected. There was no alteration of sensibility nor demonstrable weakness of the muscles. The cranial nerves remained normal.

General examination showed slight cardiac enlargement. The apex beat was in the sixth interspace 4.5 cm. outside the mammary line. The blood pressure was normal. Other examinations, includ-

ing laboratory tests, gave negative results.

Examination of the eyes showed them placed at different levels, the left eye appearing higher than the right. There was no diplopia. There was definite enophthalmos (not measured) of the left eye. No difference in the width of the lid slits was observed. The extraocular movements were normal. The conjunctivae and corneae were normal. The pupils were regular, of equal size, and reacted promptly to light and on convergence. Vision of the right eye 20/30; of the left eye, 20/30. The optic fundi were normal. Corrected vision O.U. was 20/20.

Further X-ray studies showed the left frontal sinus to be larger than the right. There was no apparent change in the bones of the skull. Blood sugar and sugar tolerance curves were normal. Phthalein excretion was 78 percent in two hours; N.P.N. was 39 mgm. percent; B.M.R. was —18.

Special tests: A series of tests was performed using pilocarpine (1/20 gr. in 10 minims of water). Pilocarpine injections produced perspiration under the armpits and flushing of the face on both sides. Local injections in the regions of the orbits caused profuse lacrimation of both eyes.

A series of electrocardiogram records was obtained. These showed a third-degree heart block (complete auricular-ventricular dissociation) which was not altered by repeated injections of atropine sulphate. The oculo-cardiac reflex showed a ventricular slowing from 45 to 41.

Interval 1933 to 1937: During this period there were no important new developments other than a gradual increase in the atrophic process. Heartblock was present constantly. The patient attended school. She was admitted and examined on two occasions, but nothing materially was added to the clinical picture.

Fifth admission (1937), age 11 years:

She was readmitted in March with a history that four months prior to this admission she had had a spell of numbness of the left side of the face and right hand and inability to speak for a period of 15 minutes. This was followed by nausea without vomiting or headache. Following this attack she had frequent attacks of nausea with a sensation of numbness in the tongue and left hand. These later spells were followed by severe headache in the left temporal region. On one occasion while in the hospital she complained of a headache followed by a sensation of haziness of vision and numbness of the right hand and lower arm. Examination of the eyes showed no change from the examination made in 1933. She contracted diphtheria, and was discharged to another hospital.

Summary of history: A girl three years old developed leftsided facial atrophy which progressed during the six years she was under observation. When she was four years old heart block appeared, and was recovered from, but recurred three years later and persisted during the remainder of the period of observation. Eight years after the onset of the facial hemiatrophy spells of numbness in the face and superior extremities occurred. Extensive studies failed to establish cause for the heart block. Special tests designed to establish involvement of the sympathetic nervous system were negative.

COMMENT

Since Jarry (Chasanow)²¹ in 1837 and Romberg²² in 1846 described progressive facial hemiatrophy, the cause of the disease has remained obscure. A review of the theories of etiology summarizes the present knowledge on the subject.

The trigeminal peripheral-neuritis theory. Mendel²³ in 1889 examined a single case at autopsy, and found a peripheral

interstitial neuritis of the fifth nerve. He cautiously suggested that this might be the basic factor in initiating the disease process. Mendel's findings were later duplicated in another autopsy case (Loebel and Wiesel).²⁴ However, in 1914 Grabs²⁵ found no involvement of the trigeminal nerve or any part of the central nervous system.

Pain in the region of the fifth-nerve distribution is a frequent symptom and may be a precursor of hemiatrophy (Oppenheim).⁵ However, typical trigeminal neuralgia is not followed by hemiatrophy. The trigeminal neuritis theory seems to be invalid because (1) section of the sensory root of the trigeminus does not result in facial hemiatrophy; (2) the atrophic process does not start invariably in, or remain in, the region of trigeminal innervation.

Although the trigeminal-neuritis theory as such appears invalid for the reasons stated above, it has been suggested that frequent limitation of the process to the region of the fifth-nerve innervation is due to involvement of the sympathetic fibers which accompany the fifth nerve. Thus it is thought to be a "trophoneurosis."

The sympathetic theory. Involvement of the cervical sympathetic probably through vasomotor control has been considered frequently as the cause of the condition (Sachs,⁴ Cassirer,²⁶ Siebert²⁷). Trauma has been recorded as an initiating factor (Bost²⁸).

In the earlier work, involvement of the peripheral sympathetic system was considered principally. Oppenheim, in his excellent review, includes cases following tuberculous infections of the apex of the lung, extirpation of the glands of the neck, and direct injuries to the face and neck, all of which might affect the cervical sympathetic system. Manthey²⁹ described facial hemiatrophy following thy-

roidectomy and remarked that signs of sympathetic injury occurred only 12 times in 1,196 thyroid operations (Kaelin's series).

On the basis of the "trophic" nature of the lesions, many authors thought there was involvement essentially affecting the sympathetic system, either through the cervical sympathetics or central sympathetic tracts, including the parasympathetics. Stief³⁰ reported the autopsy findings in a case of right-sided, progressive hemiatrophy with scleroderma in a woman of 64 years (the oldest case observed) over a period of four years. There was generalized sclerosis of the central vessels, and the brain itself showed various stages of necrosis with an interesting difference in the two hemispheres. The left hemisphere in its entirety showed coagulative necrosis, apparently from anemia; whereas the right hemisphere showed vascular dilatation and stasis. This difference between the right and left halves was less marked in the brain stem than in the hemispheres. Stief also found round-cell infiltration in the right cervical ganglia. He thought that the vasomotor change in both hemispheres was dependent upon involvement of the cervical sympathetics—that on the right to vasomotor paralysis and that on the left to vasomotor irritation. He thought that the hemiatrophy in his case was due to destruction of the opposite thalamus.

As further case records accumulated, symptoms other than facial atrophy were noted, and it became apparent that involvement neither of the trigeminus nor of the sympathetic could adequately explain the entire picture.

Epileptic fits were noted by Wolff,⁷ Wartenberg,¹ Archambault and Fromm,²⁰ Lauber,³¹ and Merritt, Faber, and Bruch.⁸ They usually commenced several years after the onset of the hemiatrophy. Case

2 here recorded is of interest in this regard.

The occurrence of fits, the occasional extensive spread of the process (Wolff,⁷ Archambault and Fromm²⁰), coincident cerebral calcification (Merritt, Faber, and Bruch⁸), ocular signs such as pupillary dilatation with loss of reflex to light (Oppenheim,⁵ Claude and Cantraine¹¹), monocular nystagmus (Langelaam³²), and ocular muscle palsies (Heiligenthal,²⁰ Sterling^{31a}) suggested central lesions. Crossed lesions in which the face on one side and the limbs and trunk on the opposite side were affected suggested midbrain lesions.

Involvement of the pyramidal tracts as reported by Claude appeared to indicate central involvement.

The infection theory. Many cases have been described as occurring after infectious diseases, and Möbius (Oppenheim⁵) thought that progressive hemiatrophy was due to some infectious process. Infection from the tonsils or following adenoidectomy has been mentioned.

Heredity of facial hemiatrophy. Klingmann³³ in this country described a family in which the grandmother, mother, and her twin daughters showed the defect. degeneration, and remarked that, in common with other such diseases, it often makes its appearance at the time of puberty. He further stated that, as in the other degenerative diseases, it may be accompanied by imbecility, congenital paralysis of the eye muscles, facial paralysis, and other conditions. However, heredity is not stressed by most authors.

Relationship between progressive facial hemiatrophy and scleroderma. It generally is agreed that differentiation between these two diseases may be difficult, if not impossible, particularly at the onset. Scleroderma does not usually occur unilaterally, but it may do so, particularly in

the circumscribed form (morphea). Some authorities (Cassirer,²⁸ Knapp³⁴) consider scleroderma and hemiatrophy to be manifestations of the same disease process. The small circumscribed patch in the skin which denotes the commencement of scleroderma usually is raised and often is of a slightly bluish or brown color, but may be depressed and free of pigment. Oppenheim, in speaking of facial hemiatrophy, stated that there might be an infiltration of the skin before the atrophy appeared, and Wartenberg described a case in which there was scarcely any involvement of the skin. Pigmentation has been observed in both diseases. For a careful differentiation the reader is referred to Osborne's³⁵ article.

The groove lying lateral to the midline in characteristic progressive facial hemiatrophy may contain hard immobile skin as in scleroderma. Pick³⁶ described such a case, diagnosed originally as scleroderma because of the characteristic appearance of the skin, which developed into a progressive facial hemiatrophy.

In other cases, however, the hard, shiny, thickened, immovable skin of the scleroderma patient scarcely can be confused with the smooth, thin, freely movable skin of the progressive-facial-hemiatrophy patient. The cause of scleroderma is as obscure as that of progressive facial hemiatrophy, and the same theories in regard to etiology have been put forward for each disease.

Ocular signs of hemiatrophy. Enophthalmos, sometimes of a high degree, is occasionally a striking result of progressive hemiatrophy whether or not it is associated with scleroderma. It was present in case 2 here reported. However, it has not been noted in the majority of cases. Exophthalmos has been observed.

Apparent upward displacement of the eye on the affected side was observed by Archambault and Fromm and was pres-

ent in case 2 here reported, but in neither instance was there an abnormal muscle balance.

Narrowing of the lid slit on the affected side has been observed frequently, but was not present in the case here reported. Chasanow²¹ reported a case which presented Stellwag's sign (infrequent blinking).

The extraocular muscles rarely are affected. Salomon³⁷ described the case of a girl of nine years who possibly had congenital syphilis, and in whom there was a weakness of the facial muscles and atrophy on the left side of the face. There was also paralysis of the right abducens, and partial paralysis of the third nerves innervating the internal recti. The vision was relatively good. There were no pupillary reactions to light nor to convergence on either side. Lacrimation was normal. Sterling^{31a} also reported abducens paralysis. Finesilver and Rosow¹⁵ recently reported a case of complete unilateral hemiatrophy with enophthalmos, slight lagophthalmos, atrophy of the nasal half of the upper margin of the lid, contraction of the conjunctival sac, and impairment of all extraocular movements. Monocular nystagmus was reported by Langelaam.³² Heterochromia iridis has been reported (Lauber,³¹ Pick³⁶).

Pupillary signs have been recorded, but are not uniform. The pupil may be dilated and fixed to light on the same side as the atrophy (Stief,³⁰ Archambault and Fromm,²⁰ Oppenheim⁵) or on the opposite side (Langelaam³²). In several instances where the pupil was narrowed, paralysis of the sympathetic fibers was evidenced by failure of the pupil to dilate with cocaine or adrenalin (Stief,³⁰ Stiefler³⁵). But in many instances the pupillary reactions were normal. Accommodation may be affected (Archambault and Fromm²⁰).

Vision was not affected in the great

majority of the reported cases. Optic atrophy was noted in a few cases (Heiligenthal and Abadie quoted by Surat,²⁹ Claude and Cantraine¹¹).

SUMMARY OF OCULAR SIGNS

Ocular signs are not constantly observed in facial hemiatrophy. When present, the principal ones are enophthalmos, rarely exophthalmos, narrowing of the lid slit, and pupillary changes. It is noteworthy that Horner's syndrome in its entirety is rather a rarity, and miosis, which is the most definite indication of an injury to the sympathetic chain, seems to occur no more frequently than does dilatation of the pupil. The latter may be ascribed in these cases to injury to the parasympathetics. However, the dilated pupils may be examples of "tonic" pupils and, therefore, have no known significance. Salomon's case loses some of its value because of the possible presence of congenital syphilis, but would indicate an extensive central lesion. Monocular nystagmus has been reported only once, and was not clear cut in that case. Heterochromia iridis has been observed rarely. It would seem to indicate sympathetic involvement during an early period of life.

The function of the eye usually is not affected.

Cardiac action in progressive facial hemiatrophy. Several authors, among them Jendrassik,¹⁰ noted a persistent increase in the pulse rate. Case 2 here reported is, so far as I am aware, the only case report of facial hemiatrophy associated with heart block. This association is probably coincidental.

The special tests in progressive facial hemiatrophy. Tests designed to reveal hyper- or hypoactivity of the sympathetic nerves have been performed in many cases, but the results were not uniform.

The most important tests are: (1) co-

caine instillations, which fail to dilate the pupil when sympathetic innervation is interrupted, or (Stiefler³⁸) accelerate dilatation when the sympathetics are stimulated; (2) pilocarpine injections, which fail to produce sweating on the area in which there is loss of sympathetic innervation; (3) temperature estimations when there is elevation of temperature in the area of sympathetic loss. In case 2 here recorded the two last-mentioned tests were negative.

Interesting conditions described in the literature may be associated with or related to facial hemiatrophy. These are: (1) hemihypertrophy, which occurs less frequently than hemiatrophy but has been reported as occurring in association with it (Sterling²⁰). (2) Lipodystrophy as described by Ziegler.⁴⁰ (3) A symptom

complex described by Passow⁴¹ under the title "Horner's syndrome, heterochromia, and status dysraphicus." Passow's paper has recently been reviewed adequately by Pino, Cooper, and Van Wien.⁴² (4) A syndrome is described by Fuller, Albright, *et al*.⁴³ under the title "Syndrome characterized by osteitis fibrosa disseminata, areas of pigmentation, and endocrine dysfunction with precocious puberty in females."

CONCLUSION

Two cases of facial hemiatrophy have been described. One was congenital, and for this reason merits recording because of its rarity. The other case deserves recording because the combination of progressive facial hemiatrophy and heart block has not been reported previously.

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STAPHYLOCOCCUS TOXIN*

AN EXPERIMENTAL STUDY IN RABBITS

J. H. ALLEN, M.D. AND A. E. BRALEY, M.D.

Iowa City

Toxins prepared from staphylococci isolated from general sources have been shown to exhibit several activities,¹⁻⁵ lethal, hemolytic, leucocytolytic, dermo-necrotic, enterotoxic and perhaps others. Several of these properties have been shown for filtrates prepared from staphylococci isolated from ocular sources.^{6, 7} This study was instituted in a further effort to correlate the properties of ocular types of staphylotoxin with those of general types. However, early in the problem normal rabbits were found to vary in susceptibility to the toxin. This phenomenon⁸ has been observed by other workers. Ramon, Richou, and Descazeaux⁹ have shown that a considerable proportion of normal rabbits possess "natural" antitoxin in their serum. This has been confirmed by Roy.¹⁰ However, Glynn¹¹ has suggested that variation in potency of the toxin also may account for the so-called variation in susceptibility of normal rabbits. Therefore, in this study the antitoxin titer of the serum of the rabbits was determined, and the potency of the toxins was titrated against standard toxin and antitoxin furnished by the National Institute of Health.

METHODS AND MATERIALS

The 10 strains of staphylococci employed in making the toxins were isolated from cases of conjunctival inflammation. These organisms produced a yellow pig-

ment on plain and blood agar, a yellow or purple growth upon crystal violet agar,¹² and produced acid in mannite media. Each strain caused coagulation of citrated human serum¹³ and produced hemolysis upon both sheep's-blood agar and rabbit's-blood agar.

Toxin was prepared from each strain of organisms by a modification of the method of Leonard and Holm¹⁴ as previously described by the senior author.⁶ Just prior to administration of the toxin, it was titrated by the hemolytic method against standard toxin and antitoxin.

The provisional standard unit of toxin, an Lh dose, has been defined as that amount of toxin which, when mixed with one standard unit of antitoxin, will cause approximately 20-percent hemolysis of 1.0 c.c. of a 2-percent solution of packed red blood cells (rabbit). The toxins prepared for these experiments were standardized in Lh units and found to range between 8 and 10 per cubic centimeter. The Lh unit, however, was too large for estimations of the "natural" antihemolytic titer of rabbit serum; therefore, a subdivision was sought. A minimal hemolytic dose (MHD) was adopted—one which would just produce complete hemolysis of 1 c.c. of a 1-percent solution of packed red blood cells. Under the test conditions one Lh unit of the standard toxin was found to contain 200 MHD.

One hundred normal rabbits weighing from 0.8 to 3 kilograms were inoculated with amounts of toxin varying from 160 to 1,500 MHD (200 to 500 MHD per kilogram). The serum of each of 70 rabbits was titrated for its antihemolytic activity. Varying dilutions of serum were

*From the Department of Ophthalmology, State University of Iowa, College of Medicine. Part of a study being conducted under a grant from the John and Mary R. Markle Foundation. Read before the Association for Research in Ophthalmology in San Francisco, June 14, 1938.

added to tubes containing 2 MHD (1/100 Lh dose) of toxin; the volume in each tube was made up to 2 c.c. with normal saline, and the mixtures were incubated in a constant-temperature water bath at 37°C. for one hour. One cubic centimeter of a 1-percent solution of packed rabbit red blood cells, which had been washed in saline three times, was added to each tube. The tubes were left in the water bath for one hour, then placed in a cold room over night. Control tubes containing standard toxin and antitoxin were set up with each titration. In this manner it was possible to estimate antihemolytic activity to 1/200 unit. However, titrations to this fraction are not accurate because of the principle of neutralization in multiple proportions, and some workers¹⁵ believe that below the level of 1/10 unit per cubic centimeter of serum the reaction is not specific.

In the beginning of the study the rabbits were given 200 to 500 MHD per kilogram in the marginal ear vein; as some of these survived, serologic studies were instituted. For this purpose approximately 10 c.c. of blood were drawn from one of the large superficial neck veins and 24 to 48 hours later toxin was administered intravenously.

A complete post-mortem examination was made immediately after death of the rabbit. Tissues were fixed in Zenker's fluid, sectioned in paraffin and stained by hematoxylin and eosin.

SEROLOGIC FINDINGS

The serum of 16 of the 70 rabbits was found to contain antihemolysin; however, only 9 contained an amount sufficient to protect against the toxin administered. Five rabbits possessing 0.5 units of antitoxin per cubic centimeter were protected against doses of 500 MHD per kilogram. The rabbits possessing less than 0.1 unit per cubic centimeter apparently were not protected against the toxin inoculations, thus perhaps lending support to the view

that with such small amounts the reaction is not specific.

PATHOLOGIC FINDINGS

The survival time varied inversely with the size of the dose of toxin per kilogram of body weight. The rabbits receiving the larger doses died in 3 to 5 minutes and those receiving the smaller doses died in 30 to 60 hours.

Rabbits dying in 3 to 5 minutes usually had one short violent convulsion ending in

TABLE 1
ANTITOXIN TITRATIONS

No. of Rabbits	Anti-hemolysin per c.c. of Serum	Dose of Toxin per Kg.	Fate
41	Not titrated	200-500 MHD	Died
5	Not titrated	200-500 MHD	Survived
5	0.5 unit	500 MHD	Survived
2	0.2 unit	500 MHD	Survived
2	0.1 unit	200 MHD	Survived
2	0.02 unit	200 MHD	Died
5	0.01 unit	200 MHD	Died
54	0.00	200-500 MHD	Died

a high-pitched squeal. Those surviving for a longer period exhibited symptoms of restlessness, increased rate of respiration, weakness, and passage of urine and feces. After lying quietly on the floor for a time, convulsive running movements developed and after one or more high-pitched squeals, the animals died.

In order to minimize the possibility of post-mortem tissue changes, autopsies were done immediately after the squeal. Heart action had ceased except for some fibrillation of the auricles; however, peristaltic movements usually continued for several minutes.

GROSS PATHOLOGY

Rabbits dying within 30 minutes after administration of the toxin exhibited very little gross pathology, but as the survival time increased the amount of congestion, hemorrhage, and necrosis increased. There was a variable amount of serous fluid in the pericardial sac. Usually the

left ventricle was in systole and the right in diastole. There were occasional sub-pericardial petechial hemorrhages in the animals surviving for longer periods. Petechial hemorrhages and small hemorrhagic areas were present in the lungs, the number and extent being in direct proportion to the time of survival. In the smaller rabbits there were superficial hemorrhages in the thymus. The liver was purplish brown, distended by an active congestion, and an occasional small sub-capsular hemorrhage was seen. The spleen also was distended and purplish brown. The kidneys were most constantly affected, but here again the acute deaths were characterized by the least gross pathology. The kidneys of rabbits dying in less than 30 minutes were acutely congested and in animals surviving longer hemorrhages were present beneath the capsule. As the survival period increased the kidneys became mottled in appearance, due to yellowish-white areas of necrosis surrounded by purplish areas of hemorrhage. The capsule could readily be stripped from these areas. The adrenals were slightly congested in the acute deaths, but were mottled by hemorrhage and necrosis in the prolonged deaths. The bladder invariably was distended. There was no evidence of gross pathology in the gastrointestinal tract in any of the animals.

Ophthalmoscopic examinations were made shortly after death in approximately half of the rabbits, but no gross pathology was observed.

MICROSCOPIC PATHOLOGY

Heart: There were a few petechial hemorrhages in the epicardium, myocardium and endocardium of rabbits surviving for longer periods. In addition there was an occasional small zone of necrosis of the muscle fibers.

Lungs: In the acute deaths there were dilatation and congestion of the capillaries

with an occasional interstitial and sub-pleural petechial hemorrhage. With an increase in the survival time, the microscopic pathology increased; there were red blood cells in the alveoli in increasing numbers, and in the more prolonged deaths there were some patchy areas of necrosis of the alveolar epithelium.

Thymus: An occasional small subcapsular hemorrhage was observed in the thymus of the smaller rabbits surviving for several hours.

Liver: In the animals dying in less than 30 minutes, the liver showed dilatation of the sinusoids and central vein of the lobule, with some cloudy swelling of the liver cells. However, as the survival time increased, patchy areas of necrosis developed about the central vein of the lobule. In rabbits surviving from 30 to 60 hours the necrosis had extended outward to include all of the cells of the lobule and practically all of the lobules were affected. In a few of the rabbits there was some evidence of regeneration around the portal spaces, with the cells appearing to arise from the bile ducts.

Spleen: The spleen, like the liver, exhibited only congestion and dilatation in the more acute deaths. The sinuses were filled with red and white blood cells as well as with large numbers of mononuclear cells. There was an increase in the number of brownish pigment granules in the phagocytic cells and in the amount of free pigment in the sinuses, indicating increased hemolysis. In the animals surviving for longer periods there was some necrosis of the cells lining the sinuses and some disintegration of the pulp.

Kidney: The microscopic changes in the kidneys were the most constant. The changes after rapid death consisted chiefly of congestion and dilation of the arterioles and glomerular capillaries. However, these were of a patchy nature, for some portions of a section showed normal arterioles and glomeruli. As the survival

time increased, interstitial and subcapsular hemorrhages appeared, and there apparently were some hemorrhages into Bowman's capsule.

In those animals surviving the inoculation for 4 to 6 hours some swelling and degeneration of the epithelium of the convoluted tubules was observed. Those surviving longer showed more extensive hemorrhages, precipitates in the tubules, and in some regions dilatation of Bowman's spaces with albuminous precipitates. At this stage some of the nuclei of the tubular epithelium were pale staining, others were pyknotic. Later (24- to 60-hour survival) the nuclei had disappeared in large portions of a section, this area being surrounded by a bluish-staining zone apparently made up largely of nuclear debris, and immediately around this was a zone of hemorrhage.

Adrenal: There was a similar time relationship in the pathology of the adrenals. First there was congestion, then followed hemorrhages and necrosis. The necrosis usually involved the medulla then the cortex. The rabbits surviving 30 to 60 hours showed almost complete necrosis of the adrenals.

No microscopic changes were observed in the gastrointestinal tract or bladder.

Microscopic examination of the eyes revealed one fairly extensive choroidal hemorrhage, but no other pathology.

DISCUSSION

The pathology produced in rabbits by these ocular strains of staphylotoxin was essentially the same as has been described¹⁶ for staphylotoxin from other sources. The only difference was the failure of these strains to produce changes in the gastrointestinal tract as described by Rigdon.¹⁷

The amount of pathology in the individual animal varied inversely with the size of the dose of toxin and directly with

the survival time. Rabbits dying rapidly showed very little pathology, those surviving for a few hours exhibited patchy zones of pathology, and those surviving for several hours presented more generalized changes. This phenomenon was expected, the typical action of a potent toxic material.

The potency of the toxin was estimated in hemolytic units shortly before its use, thus controlling any variation in the toxin. Therefore as the individual dose was measured in hemolytic units, and as the pathology and the survival time were proportional to the size of the dose, it may be concluded that the hemolytic unit was a satisfactory standard for the ocular strains of staphylotoxin.

As a further control upon the pathogenic action of the toxin, the antihemolysin content of the serum of 70 of the rabbits was estimated. Nine rabbits possessing 0.1 to 0.5 units of antitoxin per cubic centimeter of serum were protected against the usual doses of toxin. This confirmed the observations of Ramon⁹ that a considerable proportion of normal rabbits possess "natural" antitoxin. It also explained the failure of comparable doses of potent toxin to kill all the rabbits in the preliminary experiments. Therefore it was concluded that all staphylotoxin studies on rabbits should be controlled by serologic studies.

CONCLUSIONS

1. The pathogenic action of ocular strains of staphylotoxin is similar to that of general strains, with perhaps the exception of the action upon the gastrointestinal tract.

2. The hemolytic unit apparently is satisfactory for estimating the potency of ocular staphylotoxin.

3. Serologic studies should be made upon all rabbits used for experimental study with staphylococci and their toxins.

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DISCUSSION

DR. EDWARD JACKSON (Denver): In listening to the paper, this question occurred to me: Was any examination made of the central nervous system, or was there any manifest reason for the rapid death of the rabbits that succumbed before the viscera had given evidence of disease processes from the toxin?

DR. ALLEN: The examinations of the central nervous system were not mentioned, because microscopic examinations have not been completed. Gross pathology in the central nervous system was not different from that of the other organs.

The rabbits dying acutely exhibited very little pathology. Those which lived from 6 to 30 hours showed acute necrosis and a few petechial hemorrhages over the surface of the brain. In one rabbit a rather extensive subdural hemorrhage was noted. The few microscopic examinations that have been completed add nothing further. However, we believe the congestion, hemorrhages, and acute necrosis are similar to those found in the remainder of the organs and are sufficient to account for death.

THE INFLUENCE OF THE CENTRAL NERVOUS SYSTEM ON THE PIGMENT MIGRATION IN THE RETINA OF THE FROG*

HERMANN M. BURIAN, M.D.

Hanover, New Hampshire

In the series of objective changes which occur in the frog's retina under the influence of light, one of the most obvious is the migration of the pigment of the retinal epithelium. If a frog has been kept in complete darkness long enough, so that full dark adaptation has been achieved, the black-brown grains of the pigment are found in the bodies of the cells, outside of the layer of the rods and cones. In the retinas of light-adapted frogs, however, the bulk of the pigment is scattered within preëxistent cellular processes (Angelucci¹), between the rods and cones, reaching inward as far as the external limiting membrane. This migratory phenomenon is most evident in amphibia and fishes; it is less distinct in birds, and still less in reptiles. In mammals it can hardly be demonstrated.

Since its discovery by Boll² and Kühne³ in 1877, the reaction has been the subject of numerous studies. Outstanding among the older ones are the investigations by Engelmann⁴ and his pupil Van Genderen Stort⁵ who discovered another important functional change in the frog's retina, due also to the influence of light, the contraction of the cones.

Engelmann has been especially concerned with the influence of the central nervous system upon the migration of the pigment and the contraction of the cones and has reached the conclusion that such an influence must exist. The evidence he had was manifold. He found that in frogs and doves the reaction took place even

when only one eye was exposed to light, while the other was tightly covered and shielded from any illumination. This, however, happened only if the brain of the experimental animal was intact. After decerebration there was no reaction in the fellow eye. From this Engelmann inferred that there is an association between the cones and the pigment cells of the two eyes. Such a connection could be established only by the optic nerve, which, therefore, according to Engelmann, must contain centrifugal, retinomotor fibers. Another reflex migration of the retinal pigment can be observed in the frog when only the skin of the body is exposed to light, while a light-tight cap covers the head of the animal. Here again the pigment always assumes light position; the contraction of the cones is less evident. Finally, Engelmann could state that dark-adapted frogs, in which a strychnine tetanus was produced, showed totally expanded retinal pigment. Curare did not influence the position of the pigment. Stimulation of the eyes of dark-adapted frogs *in vivo* and *in vitro* with alternating induction currents of medium density produced the same effect.

Angelucci^{1, 6} also reported a series of observations which were in favor of a reflex migration of the pigment in the frog's retina. He found that this migration could be produced in both eyes by pressure on one eye or by mechanical irritation of the skin of the animal. He even contended that sound waves were able to produce the same effect. Herzog⁷ had similar results with mechanical stimulation and paid special attention to the influence of the temperature on the phe-

* From The Dartmouth Eye Institute, Dartmouth Medical School. Read before the Association for Research in Ophthalmology, at San Francisco, June 14, 1938.

nomenon. This had already been studied by Gradenigo⁸ and was later carefully investigated by Arey⁹ and Detwiler and Lewis.¹⁰ It has been shown conclusively that frogs, kept at certain temperatures, for a sufficient time, in complete darkness, show marked light position of their retinal pigment. The same result in fishes has been reported by Wunder.¹¹

One fact mentioned in Herzog's paper cited above is of special interest. Herzog stated that the retinal cones were unusually long in decerebrated frogs and in frogs in which the spinal cord was destroyed. This he ascribed to the lack of central tonus. Dittler¹² could not confirm this finding, but Garten¹³ found that it was true for animals in which he had severed the optic nerve. Hamburger¹⁴ saw this phenomenon in opticotomized frogs only occasionally.

Although all these results seem rather convincing, serious objections have been voiced against their conclusiveness. Fick¹⁵ in 1889 already pointed out that in Engelmann's experiments in which only one eye was exposed to light vestiges of light might have reached the other eye. In the experiments in which the head of the animal was covered with a light-tight cap and the skin of the body exposed to light, the respiration might have been impeded, creating a change in the constitution of the blood. This might act as a humoral stimulus on the retinal epithelial cells. Finally, it is possible that in the various parts of the retina there are differences as to the migration of the pigment.

Much more serious obstacles for the assumption of a nervous regulation of the pigment migration in the frog's retina arose, however, when Dittler¹² could show on isolated retinas that a full contraction of retinal cones takes place under the influence of acids. His experiments on the isolated retina of the frog kept in Ringer's solution showed that the exposure to light

causes the formation of acid products and that these products are able to provoke a maximal reaction of the cones. Similar results had been reported by Lodato,¹⁶ before those of Dittler were published. He had found by other methods that there is a close relation between the chemical reaction of the retina and the changes that occur in the layer of the rods and cones. The expansion of the cones corresponds to an acid reaction of the retina, their contraction to an alkaline reaction. Retinas of light-adapted frogs, therefore, always have a marked acid reaction, retinas of dark-adapted frogs show an alkaline reaction, rarely a neutral, and very rarely a slight acid reaction. The injection of strychnine produces an acid reaction of the retina. The same is true for faradization of the animal and, though to a lesser degree, for an elevated temperature (35°-40°C.), acting on the animal for from three-quarters of an hour to one hour.

In the light of these results it seemed quite justifiable to question, whether all the aforementioned reflex movements of the retinal pigment are really to be considered as such, and, up to this time, the current opinion expressed in all textbooks (see, for example, Kolmer and Lauber¹⁷) that treat of this question is that so far nothing has been found which would be definitely in favor of an influence of the central nervous system on the pigment epithelium of the retina.

EXPERIMENTAL INVESTIGATIONS AND RESULTS

From this short review of the literature it appears that the question as to whether and to what extent there is a regulatory influence of the central nervous system on the pigment migration in the frog's retina, is quite unsettled. The contribution to this particular problem was motivated by the results of previous experi-

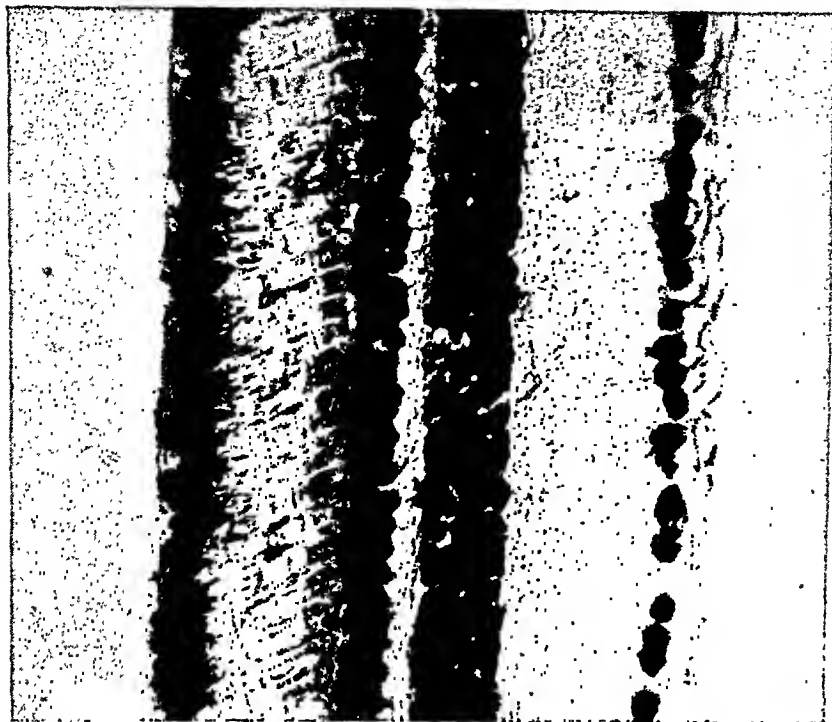


Fig. 1 (Burian). Retina of normal dark-adapted frog (control animal no. 12). The bulk of the pigment is located in the body of the pigment cells. $\times 400$.

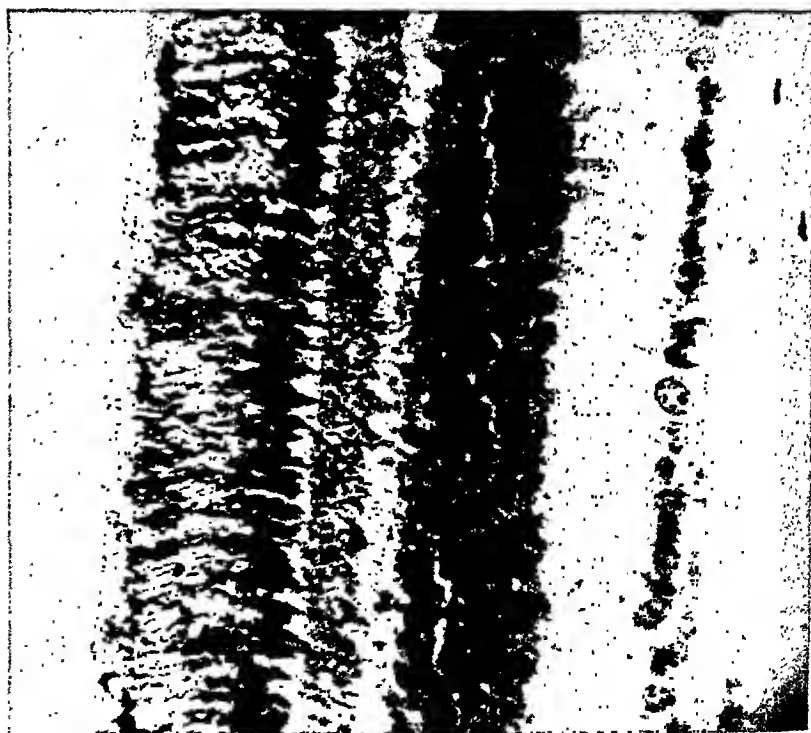


Fig. 2 (Burian). Retina of dark-adapted frog poisoned with strychnine (animal no. 13). The pigment presents maximal migration. Virtually all pigment is accumulated at the external limiting membrane. $\times 400$.

ments,¹⁸ concerning the influence of naphthalene on the spinal cord of the frog.

The experiments to which we refer showed that an appropriate dose of naphthalene administered to a frog, is able to produce a typical poisoning of the

frog. At the height of the poisoning, the frog shows absolute muscular atony and a complete lack of mechanical reflex response, while the chemical; thermal, and electrical reflex excitability remain perfectly normal. Exhaustive quantitative studies of this quite unusual reflex phe-

Fig. 3 (Burian). Retina of normal light-adapted frog (control animal no. 15). Most of the pigment is scattered along the rods and cones. $\times 400$.

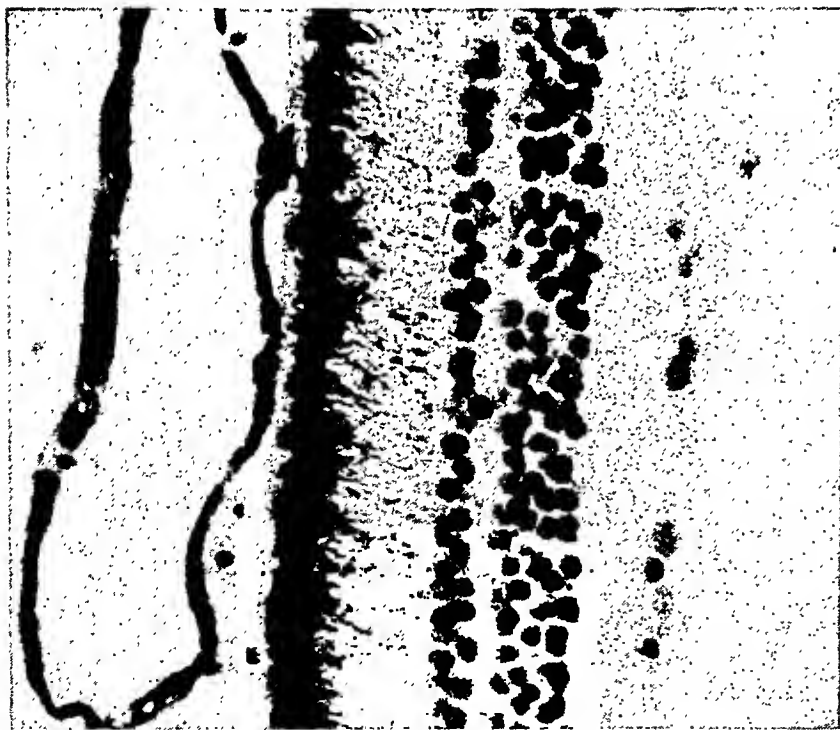
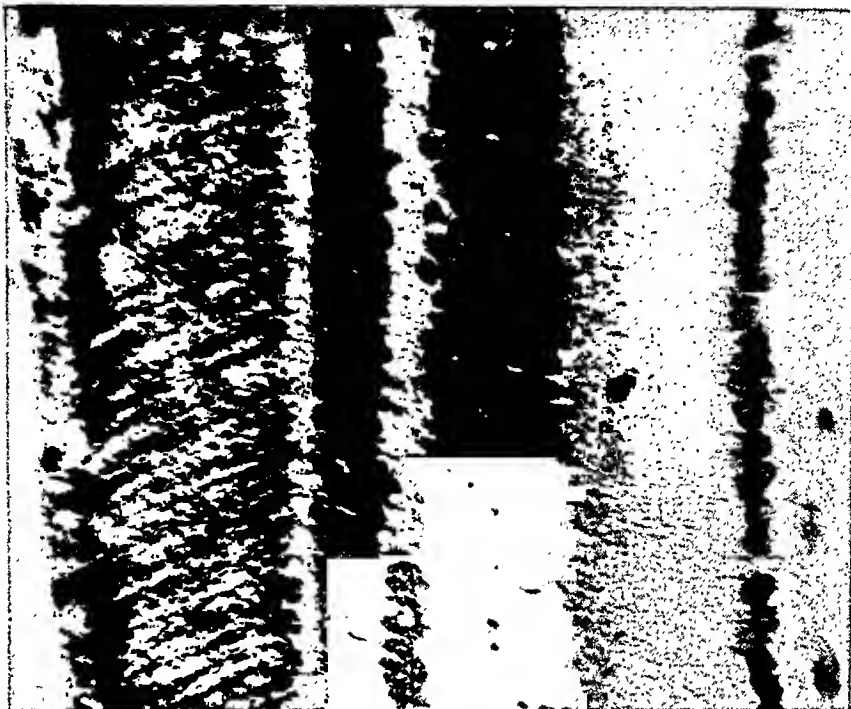


Fig. 4 (Burian). Retina of light-adapted frog poisoned with naphthalene (animal no. 16). The pigment is concentrated in the bodies of the cells. $\times 400$.

nomenon and the combination of naphthalene poisoning with strychnine or phenol poisoning gave results which can be summed up briefly as follows:

Naphthalene affects the center, not the periphery of the neuro-muscular ap-

paratus. The action of the poison is directed against the sensory, not the motor part of the spinal cord, and the seat of the poisoning is to be sought in the so-called intercalary neurones. Strychnine acts as a perfect antagonist to naphtha-

lene. While strychnine raises to the highest level the readiness of the central nervous system to react to mechanical stimuli, producing the well-known strychnine tetanus, naphthalene completely abolishes it. Consequently, the central tonus of the muscles is maximal in strychnine poisoning and virtually equal to zero in naphthalene poisoning. I shall not enter into the discussion of the mechanism of the strychnine and naphthalene poisoning, the study of which throws an interesting light on the functional structure of the spinal cord, but would state that the antagonism of strychnine and naphthalene extends also to the chromatophores of the skin. While a frog poisoned with strychnine is extremely light in color, due to the maximal contraction of the chromatophores, a frog intoxicated with naphthalene is almost invariably very dark, due to the full expansion of the chromatophores. This reaction of the chromatophores is another sign of the extremely high or extremely reduced central tonus in strychnine and naphthalene poisoning.

The behavior of the chromatophores induced me to investigate whether or not the two drugs had a similar antagonistic influence on the position of the retinal pigment. As mentioned before, Engelmann had already found that dark-adapted frogs poisoned with strychnine showed light position of the pigment and contraction of the cones. Hess¹⁹ on the other hand, reports in one of his papers that he repeatedly observed, at various places in the pigment epithelium of rabbits intoxicated with naphthalene, large groups of cells arranged in the form of a circle around a center in which all the pigment was located at one border of the individual cells, either at the border turned toward the center of the circle or at the border turned away from that center.

I conducted four series of experiments, each consisting of a number of individual tests. In the first series I repeated Engelmann's experiment with strychnine and invariably found that thoroughly dark-adapted frogs showed maximal expansion of the pigment—that is, marked light position—when poisoned with strychnine. Figure 1 shows the histologic section of the retina of a dark-adapted control animal, and figure 2 the section of a dark-adapted animal poisoned with strychnine.

In a second series, light-adapted frogs were poisoned with naphthalene. The retinas of these animals always showed a marked dark position of the pigment; that is, the pigment of the cells was accumulated in the body of the cell while the cellular processes were entirely free of pigment. This, together with the appearance of the retina of a light-adapted control animal, is shown in figures 3 and 4.

These two series of experiments seemed rather convincing, indicating that the position of the pigment could be controlled by influencing the central nervous system.

In order to confirm this assumption and to form an idea of the pathway by which this influence is exerted, performed two further series of experiments. In both series the optic nerve of one side—always the left one—was severed. In frogs this is done very easily through the roof of the mouth. The animals were then submitted to dark or light adaptation and poisoned either with strychnine or naphthalene. The result was unequivocal. The retina of the normal eye always showed the position which it had assumed under the influence of the poison in the animals not operated upon; however, the fellow-eye, which had been operated upon, presented a more or less intermediate position. In light-adapted frogs there was some indication of expansion of the pigment; in dark-adapted frogs the pigment was accu-

Fig. 5 (Burian). Normal frog, light adapted. Retina of the eye, the optic nerve of which was severed seven days previous to experiment (control animal no. 14). Most of the pigment in the cell bodies, some pigment scattered along the rods and cones. $\times 400$.

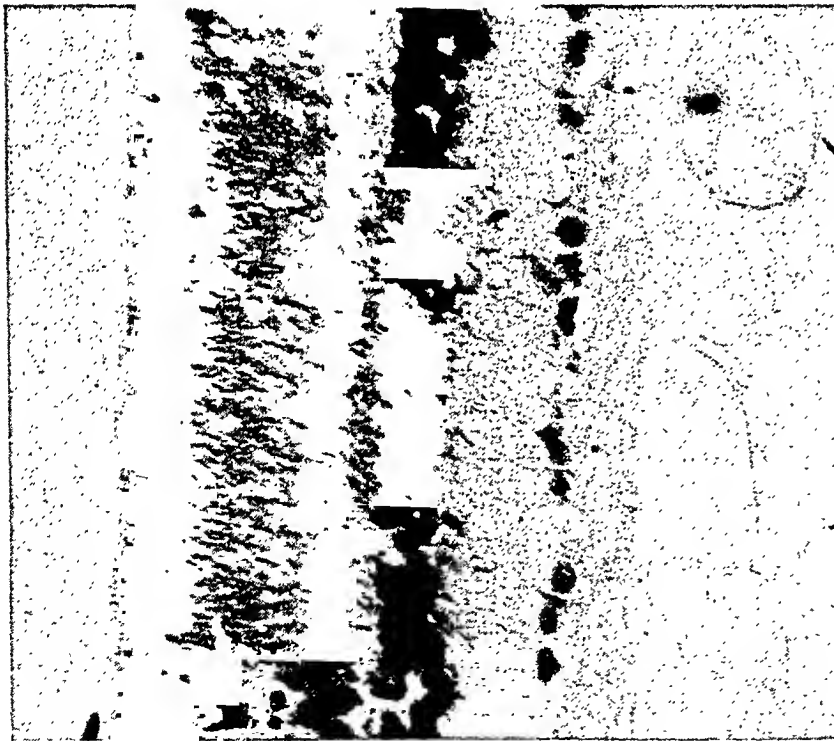
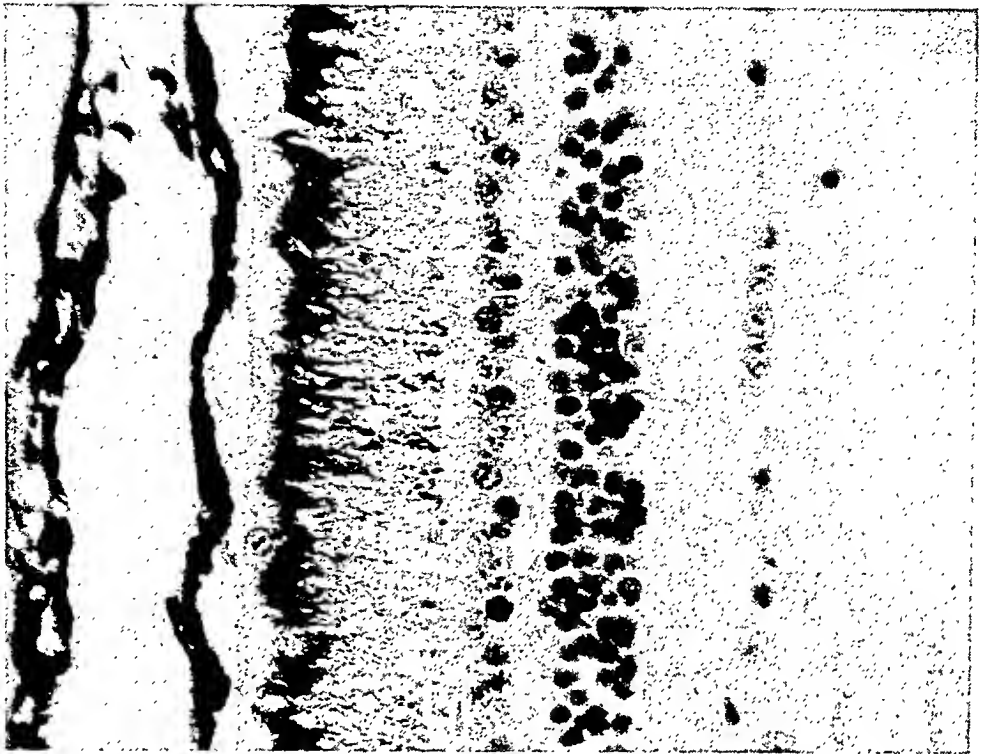


Fig. 6 (Burian). Dark-adapted frog, poisoned with strychnine (animal no. 19). Retina of eye in which opticus had been severed 18 days previous to experiment. Essentially the same distribution of pigment as in figure 5. $\times 400$.

mulated more in the body of the cells. Figures 5, 6, and 7 clearly show this behavior.

As to the *technique* of the experiments, the following may be said:

All animals were kept under exactly the same conditions. The dark adaptation was accomplished by keeping the animals

in a completely darkened room for from 12 to 24 hours. As a further precautionary measure, the jars containing both the experimental and the control animal were covered with a thick black cloth. The strychnine poisoning was done by injecting a measured amount of 0.1 percent

solution of strychnine nitrate into the dorsal lymph sac of the animal. The injection was performed in complete darkness; the enucleation at the height of the strychnine tetanus, with the aid of a neon light to which the control animal was equally exposed. The light-adapted frogs were kept for from 6 to 10 hours in a very light room; the administration of naphthalene was made orally, with the aid of a syringe on which a small rubber tube was mounted. The naphthalene used was an oily solution in the proportion of one

with the retina, made the further treatment of the specimens easier than if only the retinas had been used. The specimens were embedded in paraffin; their orientation in the block was such that the direction of movement of the microtome blade was parallel to the rods and cones. In this way they were not pushed together nor crushed. The sections were stained with hematoxylin and eosine.

CONCLUSIONS

It seems to me that the results of the

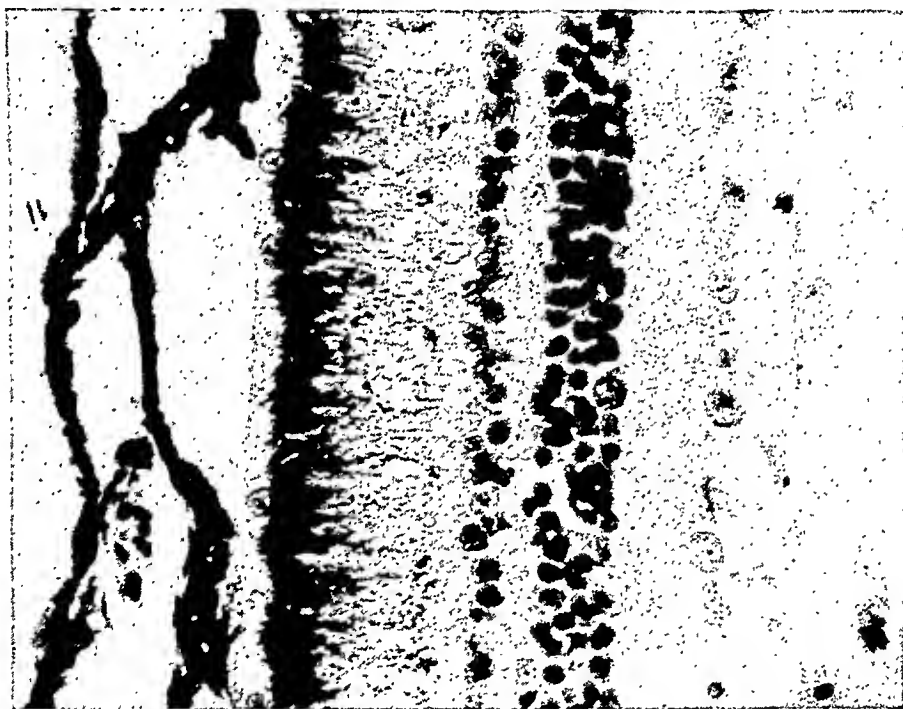


Fig. 7 (Burian). Light-adapted frog, poisoned with naphthalene (animal no. 20). Retina of eye in which the optic nerve had been severed 18 days previous to experiment. Essentially same distribution of pigment as in figures 5 and 6. $\times 400$.

part naphthalene to eight parts of paraffin oil. Various fixatives were tried out; the best results were obtained with Held's solution modified by Kolmer,²⁰ and we followed the technique suggested by Detwiler,²¹ fixing the bulbi for 12 hours and afterwards placing them in running water for 12 hours. The eyes were then opened at the equator and small circular pieces punched out of the posterior part of the bulbus with a trephine, which always allowed the use of analogous parts of the retinas of the various animals. The choroid and sclera, remaining in contact

experiments permit only one explanation. It has been shown clearly by pharmacological experiments that the effect of both strychnine and naphthalene is a central one; that is, that the manifestations of poisoning which were observed were due to an affection of the central nervous system. Since I was able to influence the position of the retinal pigment by the administration of these drugs, it may be assumed that this position was influenced by way of the central nervous system. In other words, the position of the retinal pigment is influenced by a central nerv-

ous tonus, as had been previously assumed by Herzog, and in the present experiments it was possible to change the position of the retinal pigment by raising or lowering this tonus. If the central tonus is brought to a maximum artificially, as is the case in strychnine poisoning, the pigment assumes a light position and is expanded even beyond the normal limit. In keeping with the accepted explanation of the effect of strychnine, it may be assumed that the excitability of the sensory part of the central nervous system has become maximal and that, therefore, stimuli of relatively low intensity lead to a maximal effect. A reflex migration of the retinal pigment, such as Angelucci found in his experiments with mechanical stimulation of the skin, would, under these conditions, be extremely favored.

The opposite is true for naphthalene. These experiments have shown that naphthalene lowers the central tonus of the muscles to a minimum, due to the reduction in the influx of impulses into the central nervous system. The sensorial part is, so to speak, blocked. According to the lack, or extremely low level, of the central tonus, light-adapted naphthalene frogs show unexpanded pigment.

The experiments of Lodato and Dittler, cited in the introduction, do not seem to invalidate my statements. It has been proved beyond doubt, that light as well as other factors (strychnine poisoning, heat, faradization) produce an acid reaction of the retina and that acids in their turn are able to provoke a contraction of the cones. Hence, it may be concluded that the local condition that gives rise to the pigment migration is the formation of acids. These acids, however, can be produced by various means: by direct illumination, by changes due to nervous influences, and, finally, by local and general humoral changes.

The influence of light as well as of the

general humoral conditions is not restricted to the retina. Light, as is well known, has a definite effect on the central nervous system, affecting the level of its basic tonus, which is, of course, also under the influence of the humoral conditions present in the body.

In the light of these conclusions we should consider all experiments concerning the pigment migration induced by other stimuli than light—that is, the various reflex movements—reported in the introduction, and the movements due to various drugs (cocaine, santonine, adrenalin).

Finally, as to the pathway by which the central nervous system exerts its influence, it seems to me, in accordance with the reported experiments in which the optic nerve had been severed, that the old conception of Engelmann is justified, that the optic nerve contains centrifugal, retinomotor fibers. This conclusion is contrary to that at which Shoko Kyo, a Japanese author, arrived on the basis of his experiments, which are reviewed in the *Zentralblatt für die gesamte Ophthalmologie*.²² He states that in frogs in which the optic nerve had been severed unilaterally, faradization as well as the application of drugs which produce a migration of the retinal pigment have the same retinomotor effect on both eyes. He does not believe, therefore, that the retinomotor impulses are transmitted through the optic nerve. I am unable to say to what this difference in the findings is due, all the more since Kyo's paper was accessible to me only in the review mentioned. In another paper Kyo²³ reports the results of experiments in which he has studied the effects of a great number of drugs on the pigment migration of the frog's retina. His conclusion is that drugs, stimulating the central nervous and the sympathetic nervous system, cause a migration of the retinal pigment, while

drugs having the opposite effect on the nervous system do not influence the retinal pigment. This, according to my experience, does not apply to naphthalene.

The author is greatly indebted to Dr. Ralph E. Miller of the Department of Pathology, for his generous help. The histological sections were excellently done by a technician on the staff of Dr. Miller's laboratory. Dr. Adrian Kameraad, of the Department of Biology, was kind enough to make the microphotographs reproduced in this paper.

SUMMARY

Experiments with strychnine and naphthalene have shown that the retinal pigment of dark-adapted frogs shows light position when the animals are poisoned with strychnine, and that in light-adapted frogs poisoned with naphthalene the retinal pigment assumes dark position.

From this the author concludes that there is a regulating influence of the central nervous system on the position of the retinal pigment.

In frogs, in which the optic nerve on one side was severed, the drugs did not influence the eye operated upon. The author concludes that the pathway through which the central nervous system exerts its influence must be located in the optic nerves, supporting Engelmann's theory of the existence of centrifugal, retinomotor fibers in the optic nerve.

The position of retinal pigment appears to be influenced by the following factors: (1) the basic tonus of the central nervous system; (2) the "light tonus" of the central nervous system; and (3) local humoral conditions due to the influence of light and various general metabolic factors.

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DISCUSSION

DR. FREDERICK H. VERHOEFF (Boston): I should like to ask the essayist whether or not he has excluded the pos-

sibility that cutting the optic nerve has affected the retina in such a way that it will not respond. If you cut the optic

nerve, it affects the retina profoundly, for subsequently the ganglion cells disappear. I have always assumed that the effect was very great the moment you injured the optic nerve; that it was due to changes that take place, electrical and chemical, the result of the cutting, and that these changes cause impulses to pass backward along the nerve and injure the ganglion cells.

If the retina has been injured, of course, you would not expect it to respond to the action of a drug as does a normal retina.

Assuming, however, that this is not so, is it necessary for the essayist to assume that there are special nerve fibers going back into the retina?

We know if you stimulate any nerve, motor or sensory, impulses will pass in both directions. I think it was Head who drew attention to what he called antidromic impulses that pass backward along sensory nerves. Isn't it possible that in the optic nerve the fibers that ordinarily carry the impulses to the brain would serve the purpose for which the essayist hypotheticates special nerve fibers?

Then I should like to have Dr. Burian make a diagram illustrating his conception as to how nerve impulses passing to the retina affect the pigment cells. He may have several different ways to suggest.

DR. BURIAN: The first point brought out by Dr. Verhoeff, of course occurred to me, too. It is quite probable that the cutting of the optic nerve profoundly affects the eye; however, I thought that this, at least to a certain extent, could be paralyzed by taking the animals in various stages after the cutting of the optic nerve, or up to 20 days after the cutting of the optic nerve.

As to the retinal motor fibers, whether there really are retinal motor fibers or whether it is a question of conduction of the impulse both ways, I could not say;

for the experiments on which I am reporting do not explain this sufficiently. However, in view of Engelmann's experiments, which show that there is not only a direct influence from the brain to the eye, but from one eye to the other, we have necessarily to assume that there must be some kind of reflex arc and, therefore, afferent and efferent fibers and a center should be present.

DR. VERHOEFF: It doesn't seem to me that that follows. All that is necessary is for impulses to get back to the other eye.

DR. BURIAN: I can't quite see how the impulses would come from one eye through the brain, through the centers to the other eye, without having a special afferent fiber.

DR. VERHOEFF: It seems to me it would be very simple. Somewhere fibers from the two eyes go to the same place; otherwise an image from one retina could not be unified with one from the other retina. Hence impulses from one retina could be carried back to the other.

DR. BURIAN: My talk was not concerned especially with the retinal motor fibers. What I wanted to show most was that there was an influence of the central nervous system on the pigment migration. The way it is carried on is, I thought, by special fibers—or else by the same fibers, only with other impulses going the other way, and my experiments, unfortunately, don't give any answer to that.

DR. VERHOEFF: I take it that now you admit that your investigation does not prove the existence of special fibers.

DR. BURIAN: I still think as we usually do, that when there is a reflex action, there must be three elements.

DR. VERHOEFF: What we usually think isn't necessarily true.

DR. BURIAN: I didn't want to go into a criticism of the reflex action.

DR. VERHOEFF: Well, you brought it up!

DR. BURIAN: Yes, I did, but I don't think it is quite that way. I feel that the explanation that there are special fibers, is simpler than to assume that in the same nerve fiber the impulses go back and forth.

DR. VERHOEFF: It is more complicated to think there are two things, than one.

DR. BURIAN: Not necessarily, I think.

DR. VERHOEFF: It is to my mind.

DR. BURIAN: The third question I do not quite understand.

DR. VERHOEFF: You claim that there are these special fibers. I want you to draw a diagram of a retina and show how they act.

DR. BURIAN: I wouldn't be able to make a diagrammatic drawing of the effect of the impulses on the retinal pigment.

DR. VERHOEFF: Roughly explain how you think the impulses act.

DR. BURIAN: The way by which they act?

DR. VERHOEFF: You say that the impulses come to the retina and affect the pigment epithelium. We would like to have some idea just how they could do this. You must have some conception as to this because you think it possible. Just mention one way you think it could happen.

DR. BURIAN: I don't have any special conception about that, about the mechanism of this effect; you mean, anatomically?

DR. VERHOEFF: You have that nerve impulse coming to the retina. I want to know what it does after it gets there.

DR. BURIAN: I have no special—

DR. VERHOEFF: I think it is rather difficult to assume the impulses if you can't think of any way they can act.

DR. BURIAN: There are probably various ways, but I brought out modestly the fact that this occurs. I haven't attempted

any explanation.

DR. VERHOEFF: That leaves it a little doubtful that nerve impulses are concerned in the matter. Perhaps the effects are produced directly from the blood.

DR. BURIAN: I think the important point is that it is not produced by the blood. We know from other pharmacological experiments that these two drugs, strychnine and naphthalene, affect a definite part of the central nervous system. There is no reason why suddenly, in this case, these drugs should affect by way of the blood.

DR. VERHOEFF (interrupting): You don't mean to say that the retina isn't part of the nervous system, do you?

DR. BURIAN: Oh, yes, that is right.

DR. VERHOEFF: Why couldn't that be affected directly?

DR. BURIAN: It still wouldn't be by way of the blood. You see, the nerve endings are also part of the nervous system, and are not directly affected by strychnine and naphthalene.

DR. VERHOEFF: You are sure they are not?

DR. BURIAN: In the case of naphthalene—

DR. VERHOEFF (interrupting): In the retina, you mean?

DR. BURIAN: I wouldn't have any way of checking that in the retina. The influence of strychnine, we know, in man is not peripheral—or do you think so?

DR. VERHOEFF: I don't know, as concerns the retina. You are the one trying to tell us that.

DR. BURIAN: Not in man.

DR. VERHOEFF: I want to know how conclusive your evidence is.

DR. BURIAN: I don't know whether there is anything else.

DR. VERHOEFF: I haven't anything else in mind.

DR. BURIAN: Thank you.

A CONTACT-LENS-TELESCOPIC SYSTEM*

JEROME W. BETTMAN, M.D., AND G. STUART MCNAIR
San Francisco

Attempts have been made for centuries by the use of innumerable optical devices to help those unfortunate individuals who have suffered a drastic and permanent reduction of visual acuity. In 1646, Kircher designed a hand telescopic spectacle for near use. Dixon, in 1785, constructed a telescopic spectacle from two spherical mirrors, which were later replaced by spherical lenses. In more recent times, Hertel and Von Rohr developed the familiar Zeiss telescopic spectacle. The Hamblen Company of England and Feinbloom of New York likewise devised telescopic spectacles. The Feinbloom type is designed on the anomophotic principle: magnification in the horizontal meridian is $\times 1.8$, while in the vertical meridian it is only $\times 1.3$. With this type an image magnified $\times 1.8$ is seen at a distance which seems to approach more nearly the actual distance.

The ordinary types of telescopic spectacles are large, heavy, and conspicuous. The patient's field of vision is restricted to a dangerous degree. Many ophthalmologists have reported that most of their patients who can secure improvement in visual acuity in no other way cannot be persuaded to wear the telescopic lenses in public. Even the nearly blind are vain about their personal appearance and the restricted visual field is both an annoyance and a hazard.¹

To overcome these difficulties we conceived the idea of producing a telescopic spectacle by using a contact lens for the eyepiece and a highly convex ophthalmic lens for the objective. The appearance of such an arrangement is only slightly

more objectionable than that of the ordinary cataract lens. The field of vision is larger than with the ordinary telescopic spectacle of $\times 1.8$ magnification, with which the visual field is reduced to 24 degrees.

A search of the available literature revealed the fact that the theoretical possibilities of this arrangement had been suggested by Dallos² and Boeder;³ however, neither of them tested the principle in actual practice.

Before proceeding with the description of this telescope, let us briefly consider some of the properties of telescopic spectacles in general. All telescopic spectacles are constructed on the Galilean principle, a positive objective and a negative eyepiece separated by the difference of their focal lengths. This practice is followed because:⁴

1. Galileo's is the only system in which two simple lenses produce an erect image. Other telescopic systems need an erecting system which makes them thicker and heavier and results in additional loss of light (4 percent at each glass-air surface).
2. In other telescopic systems the lenses are separated by the arithmetic sum of their focal lengths, not their difference; therefore, the telescope must be longer.
3. The Galilean type of telescope produces less astigmatism with a large flat field than do other types of telescopes.
4. Galilean telescopes have a large exit pupil.

The following simple formulas govern the construction of a Galilean telescope:

$$\frac{F1}{F2} = \text{magnification}$$

Where $F1$ = focal length of the objective lens, $F2$ = focal length of the eyepiece.

The lenses must be separated by the difference between their focal lengths, that is, $F1 - F2 = D$.

The following simple principles must

* From the Department of Ophthalmology, Stanford University Medical School.

be followed in the construction of a telescopic spectacle:⁵

1. The telescope must be of relatively low magnification, otherwise the speed of movement of objects and the reduction of visual field is not tolerable.
2. The interpupillary distance of the telescopic spectacle must equal that of the wearer. If it does not, the symmetry of the visual field and the definition of the image are impaired.
3. The frame must be absolutely rigid so that tilting of the spectacle around the antero-posterior axis cannot occur. When a telescopic spectacle is tilted, the periphery of the optical system is brought into use. This results in increased chromatic aberration and astigmatism.

The patient for whom we devised this contact-lens-telescopic system was unable to wear an ordinary telescopic spectacle. The unsightliness of the telescopic spectacles was a grave handicap in his search for employment even though his vision was improved from 8/200 to 20/100 +1 by them.

As far as we know the only type of telescopic lens previously designed to overcome the impairment of visual field and the unsightliness of the usual telescopic spectacle is that advocated by Berliner.⁶ The lens that Berliner described was designed by Polackoff and developed by the Univis Company. It consisted of strong positive and strong negative flint lenses of a high index of refraction separated by a Crown glass component of a low index of refraction—all components being permanently fused together. This solid-glass telescope was then set into a carrier lens mounted in an ordinary spectacle frame. The Univis type is definitely an advance over the customary type of telescope, but is certainly not so inconspicuous as one would desire.

The contact-lens-telescopic system here described was designed to be as inconspicuous as possible and to allow the patient to use his entire visual field. A contact lens served as the eyepiece, and

a biconvex lens in a spectacle frame was used as the objective. To avoid undue separation between the spectacle (objective) and contact lens (eyepiece), it was apparent that the effective diverging power of the contact lens must be as great as possible. Only then could an objective (spectacle lens) of high power and short focal length be used, so that both the desired magnification and the short distance between the objective and eyepiece would be obtained.

A few examples will serve to emphasize this: A simple telescope with a magnification of $\times 2$ was constructed by Eggers⁷ by using a +5.00 diopter objective and a -10.00 diopter eyepiece separated by the difference of their focal lengths, 10 cm. If a +10.00 D. objective and a -20.00 D. eyepiece had been used, the separation would have been only 5 cm.

The cornea acts as a converging lens of approximately 45 diopters because of its convex curvature. A contact lens eliminates the cornea as a refracting medium. The converging power of the contact lens, which depends upon the curvature of the corneal segment of the contact lens, is substituted for that of the cornea. Consequently, we decided to use a contact glass on which an entirely flat surface had been ground, as this would optically eliminate the cornea as a converging lens. In other words, the cornea, which acts as a strong converging lens, could be optically neutralized. Therefore, the same effect would be produced as when a strong minus lens of a dioptric power equal to that of the cornea is held in front of the eye. Our patient's corneal curvature was found to be 44 diopters with the keratometer; consequently, with this eliminated by the flat-surface contact lens, the effect produced would be that of a -44 diopter lens. This, then, would serve as the minus lens (eyepiece) of a Galilean telescope. One would then expect

a magnification of $\times 2$ with an ordinary $+22$ diopter lens (objective of the telescope) set in a spectacle frame 27 mm. from the eye (the difference of the focal lengths of the two lenses). To reduce the cosmetic disfigurement, a stronger plus lens, a $+29$ biconvex lenticular, was used at a shorter distance from the contact lens (18.5 mm.) with approximately $\times 1.6$ magnification. With this combination of lenses, the patient was able to read 20/100.

The contact glass was ground on the principle of the Dallos contact glass.⁸ In this type of glass the optically effective region of the corneal portion is only the central 8 mm. This permits the grinding of a much higher correction on the contact glass without excessive increase in weight or thickness of the glass. In our contact glass the optically effective portion was restricted to 6 mm., on the anterior surface of whose corneal segment a flat surface was ground. The posterior surface of the corneal segment was made sufficiently concave just to clear the cornea, as is the case with an ordinary contact lens. The scleral curve was that which fit with the greatest comfort (again as with the ordinary type of contact lens). The optically effective portion was restricted to 6 mm. instead of 8 mm., as in the Dallos contact glass, in order to facilitate grinding without increasing the weight of the glass. Observation of the patient's pupil showed that it did not dilate over 4 mm. under ordinary conditions; therefore, a 6-mm. corrected corneal portion was sufficient. The weight of the finished contact lens is 0.6 gm. instead of the usual 0.5 gm., is thoroughly comfortable, and has been very satisfactory.

The objective lens for distance was a $+29.00$ diopter lenticular type, biconvex lens set in a very rigid frame made of zylonite and metal. A metal bridge and pad arms were used to obtain an exact

adjustment and rigid fit. The pad arms were especially made from solid gold stock, tempered to the proper hardness. This was necessary because of their unusual length of 19 mm.

As mentioned above, the patient is able to read 20/100 with this contact-lens-telescopic system, without experiencing vertigo or excessive chromatic aberration. A plano balance was placed in the spectacle frame before the uncorrected eye so that the patient might have the advantage of a large field (vision in this eye was 6/200). No diplopia nor confusion was caused by leaving this eye open. No attempt was made to correct the poorer eye with the same type of telescope.

In the Zeiss telescopic spectacle the reading addition is placed on the front of the object lens. The standard reading addition is a $+4$ lens. The magnification obtained with this reading addition is $\times 1.8$, the same as that obtained with the distance portion. A $+8.00$ D. reading addition gives twice the magnification of the distance portion, 2 times 1.8, or $\times 3.6$. To read newspaper print fairly well without further magnification in the reading addition the patient's distance vision with the telescopic lens should be about 20/50. If it is less than this the reading addition should be greater than a 4-diopter lens so that further magnification is obtained.⁹ Thus, a patient with 20/100 vision with a distance telescope should have a $+6.00$ D. reading addition. This is done to supply a magnification of $\times 1.5$ for reading besides the $\times 1.8$ magnification that he already has for distance. Thus, a total magnification of $\times 1.5$, 1.8, or 2.7 is available for reading. The reading distance, depth of focus, and visual field are reduced with further increase in the magnification; therefore, additional magnification for reading should not be prescribed unless it is necessary.

The visual acuity of our patient was

20/100 with this telescopic system. Accordingly, we decided to use a +6.00 D. addition for reading. A +35.00 D. biconvex lenticular lens, incorporating the +6.00 D. addition with the +29.00 D. objective, was mounted in another spectacle frame similar to the one described above. The finished spectacle is shown in figure 1.

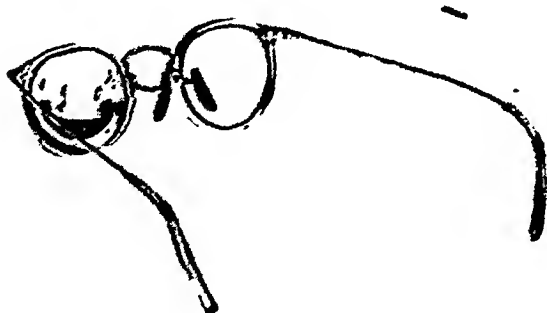


Fig. 1 (Bettman and McNair). Spectacle of the contact-lens-telescopic system showing long pad arms.

With this the patient could read Jaeger 1 with some difficulty at a distance of 13.5 cm. He was able to read 48 words of ordinary size newspaper print a minute. With his Zeiss telescopic spectacle and +8.00 D. reading addition he was able to read only Jaeger 2 and 35 words per minute. The cosmetic improvement can be seen by comparing figures 3 and 4.

For those who may wish to prescribe the contact-lens-telescopic spectacle described, the following outline of procedure may be of value:

1. Determine the refractive error.
2. Measure the corneal curvature with a keratometer.
3. Try on contact lenses of the ordinary type from a trial set to determine the correct scleral curvature and to be certain of the clearance of the corneal segment. The radius of curvature of the cornea may also be determined from Obrig's table.¹⁰
4. A contact lens of the Dallos type with a 6-mm. flat anterior surface and the posterior corneal and scleral radii determined in step 3 may then be ordered. Should the patient's pupil be larger than 4 mm.,

the flat surface of the contact lens may have to be somewhat larger.

5. A convex lens of approximately one half the dioptric power of the corneal curvature (which has been optically eliminated by the contact lens) should be placed before the eye with the contact lens in place. The distance between the contact lens and the objective lens must be approximately the difference between the focal lengths of the objective lens and the eyepiece (contact lens). The optimum distance between the objective and eyepiece and the power of the objective are somewhat modified by the magnification desired, the refractive effect of the fluid meniscus between the contact lens and cornea, and any existing spherical ametropia of the eyeball.³ The details can be worked out with a trial set.
6. A biconvex, preferably lenticular, lens is ordered and placed in a very rigid frame. The nose pads are built up to hold the lens at the required distance from the contact lens.
7. The optical center must be adjusted to coincide precisely with the center of the patient's pupil. The slightest variation will blur the image.
8. An objective lens for reading equal to the power of the distance objective lens plus the reading addition required is then mounted in a frame similar to the one used for the distance objective lens. A 4.00 D. addition is sufficient if no magnification other than that given by the distance telescope is needed (that is, if the distance vision is 0.5 or better with the telescope). Stronger reading additions to produce greater magnification may be used as required.

It is wise to test the patient with a telescopic lens of the usual type from a trial set, to be certain that substantial improvement in vision will be obtained, before he is subjected to the expense and time necessary to obtain a contact-lens-telescope.

Case history. J. G., a white male, aged 50 years, was first seen in October, 1936. He had had no difficulties until two years before entry, at which time his vision failed gradually. His general health had always been excellent.

Examination: Vision was R.E. 7/200; L.E. 8/200; but no Jaeger for either eye. Both eyes were normal externally.

Fundi: White raised areas of fibrous-like tissue in the macular regions were seen in both eyes. That in the right eye was: 1 by 1½ disc diameters in size (fig.

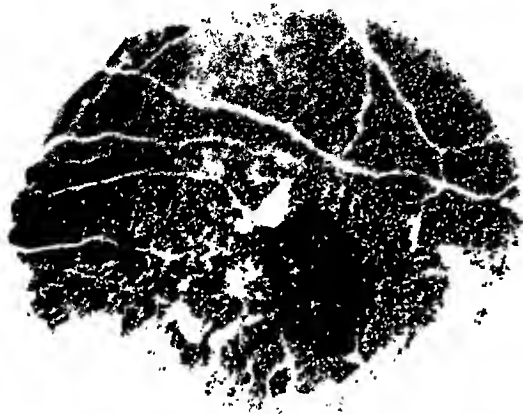


Fig. 2 (Bettman and McNair). Photograph of fundus of patient's left eye showing raised, white, tumorlike mass in macular area. This eye was corrected to vision of 20/100+ and Jaeger 1 with difficulty by using the contact-lens-telescopic system.

2); that in the left eye, 2½ by 4 disc diameters. One small superficial hemorrhage was present at the edge of the area in the right eye. The fundi were otherwise normal. The tension also was normal, as were the ocular rotations.

Retinoscopy: R.E. +.25 D. cyl. ax. 180°; L.E. +.50 D. sph. = +.50 cyl. ax. 120°

Visual fields: Absolute central scotomata were present in each eye with a 1.5-mm. white object on the Walker screen at one meter. The scotomata extended irregularly between the 5° and 20° circles in each eye. The peripheral fields were normal.

The general medical examination uncovered no pathology.

Laboratory examination: Blood, urine, blood Wassermann, and spinal fluid were negative.

Impression: Disciform macular degeneration.¹¹

Telescopic lenses of the Zeiss type were fitted from a trial case. The following lenses resulted in the vision indicated:

O.D. 0 Base Zeiss × 1.8 with -50.
D. sph. 20/200

O.S. 0 Base Zeiss × 1.8 with -50.
D. cyl. ax. 60° 20/100 +1

Add O.D. +8.00 —Jaeger 16

O.S. +8.00 —Jaeger 3

(The above was prescribed for the left eye only.)

In August, 1937, the patient returned having the same vision with the telescopic spectacles as when they were prescribed. He had been able to use the lenses successfully. However, the unsightly appearance of the spectacles and his inability to see without them had caused his application for several jobs to be rejected. The reduction in visual field was annoying to him. Accordingly, the procedure outlined above was carried out and the following contact-lens-telescopic spectacle was prescribed for the left eye.

Eyepiece: 2/7.5 Dallos-type contact lens with flat anterior corneal surface 6 mm. in diameter.

Objective lenses: Biconvex lenticular, +29.00 D. sph. for distance, +35.00 D. sph. for reading.

The *mounting* consisted of a special rigid metal frame with nose pads built up.

With this combination the patient was able to see 20/100+ in the distance and could read Jaeger 1 with some difficulty. His visual field for distance was no longer restricted. The lens looked far less conspicuous than the usual telescopic lens, although not so inconspicuous as an ordinary spectacle. The patient experienced no untoward symptoms such as color aberration, vertigo, or headaches. He has but little difficulty in keeping his place



Fig. 3 (Bettman and McNair). Patient wearing Zeiss telescopic spectacles.
 Fig. 4 (Bettman and McNair). Patient wearing contact-lens-telescopic system.

while reading, as was demonstrated by his ability to read 48 words of ordinary newspaper print per minute.

Several improvements or alternatives in the telescope described may at once strike the reader. To produce a thinner lens the objective may be ground from high-index lead glass. However, such a glass would not weigh less, and would scratch more easily. A bifocal objective spectacle may be conceived but a +6 or 8 D. addition would hardly be practical. The need for exact adjustment of the pupillary distance of each segment would further increase the difficulty. It also occurred to us that instead of a flat surface, a concave surface might be ground on the corneal segment of the contact lens in order to yield a stronger eyepiece. This was discarded as impractical because accumulation of lacrimal secretion in the concave portion would probably destroy the optical effectiveness, and such a lens

would be most difficult to grind.

The contact-lens-telescopic system is indicated in the same types of visual impairment as is the ordinary telescopic lenses. In those patients whose vision is permanently reduced from high myopia or a macular lesion they are most useful and satisfactory.

SUMMARY

A method for constructing a telescopic spectacle by using a contact lens with a flat corneal segment as an eyepiece and a strong positive lens in an ordinary spectacle frame as the objective has been described. The patient for whom this contact-lens-telescopic system was prescribed was able to see as well at distance with it as with his Zeiss telescopic lens, and was able to read better. The cosmetic disfigurement was much less than with the Zeiss telescope and the field of vision was not restricted.

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VITAMIN THERAPY IN OPHTHALMIC PRACTICE

JOSEPH LAVAL, M.D.

New York

Much has been written about the importance of vitamins in general medicine, and three reviews have appeared in ophthalmic literature. It must of course be realized that much of what follows will be only suggestive and show certain trends and indications as to the uses of the various vitamins in ophthalmic practice. Definitely positive statements and findings will be infrequent, but some general conclusions will be self-evident.

VITAMIN A

This vitamin is best associated in our minds with cod-liver oil and recently with haliver oil. It is present in good amounts in eggs, butter, milk, cream, and such dairy products. A deficiency of this vitamin manifests itself clinically first, as night blindness (hemeralopia) and later as xerophthalmia. Recently, dark-adaptation tests in early and beginning A avitaminosis have been advocated, but as yet they are not sufficiently standardized to warrant positive statements. It has been

shown that the visual purple of the retina after exposure to strong sunlight regenerates slowly in the eyes of rats on a diet deficient in vitamin A (Fridericia and Holm) and it has also been proved that the normal retina is rich in vitamin A (Holm, also Yudkin, Kriss, and Smith). Vitamin A has been used to cure xerophthalmia and the hemeralopia due to depletion of vitamin A with, of course, brilliant results, as witness the cases of the fishermen of Labrador as reported by Aykroid, and the cases of the natives of the Philippine Islands reported by Gamboa. However, vitamin A has been used for the hemeralopia due to retinitis pigmentosa with no improvement at all, as was reported by me in 1933 (Levine).

Vitamin A is being used also in the conjunctival sac with massage into the cornea in cases of keratitis dystrophica, but the results are variable. Some authors report brilliant results, others no improvement. In the writer's own experience there were some cases in which it seemed to do

much good, others in which irritation and aggravation of the symptoms resulted.

In certain cases of blepharitis and conjunctivitis in children there is no doubt that malnutrition is a factor, and here large doses of cod-liver oil are beneficial. Pillat reports the changes in Chinese eyes as a result of vitamin-A deficiency and mentions night blindness, dryness of the conjunctiva, Bitot's spots, xerosis, and even keratomalacia, meibomitis, hordeolum, and blepharitis. Vitamin A is also of use in phlyctenular keratoconjunctivitis and other related conditions of scrofulous origin. In women a low-grade chronic conjunctivitis with mild photophobia may be due to A avitaminosis as a result of dieting in the effort to keep a streamlined figure. Langdon described the case of a young woman who used no butter, eggs, or milk and had a corneal dystrophy which cleared up on the administration of cod-liver oil.

When depletion of vitamin A is advanced, changes in the lacrimal gland result with diminution and even entire loss of lacrimation. Mori showed that these changes in the lacrimal gland were responsible for conjunctival changes in xerophthalmia, which then gave rise to the corneal changes. Yudkin, in similar experiments, drew different conclusions as to which lesions arose first, but Wolbach and Howe demonstrated that all the changes are due to a replacement of the columnar epithelium by stratified squamous epithelium going on to keratinization.

In diabetics there may be an increased demand for vitamin A, as certain experiments by Ralli *et al* showed. In depancreatized dogs (artificial diabetes) it was found that definite corneal epithelial changes occurred of the same type as in vitamin-A deficiency. These corneal changes were prevented by feeding cod-liver oil to the depancreatized dogs. Ap-

parently, in these diabetic animals the demand for vitamin A is increased.

VITAMIN B

This vitamin is found in such foods as meats, potatoes, and green vegetables, but is most concentrated in yeast. It has various complex components the most important of which are B₁, the antiberi-beri component (thiamine), and B₂ or G, the antipellagra portion (riboflavin), the absence of the latter causing cataracts in rats. However, for clinical purposes it is to be remembered that concentrated yeast tablets as marketed by any of the reliable pharmaceutical firms contain B₁ and B₂ in high amounts. (For a complete study of the vitamin-B complex see the article by E. M. Nelson in the *Journal of the American Medical Association*, 1938, v. 110, Feb. 26, no. 9, p. 645.)

In the *Archives of Ophthalmology* for December, 1934, the writer reported a case of bilateral acute optic neuritis with marked diminution of vision associated with pellagra. (It is known that the peripheral neuritis of pellagra and of beriberi is due to the lack of vitamin B₂ and B₁, respectively.) In this case the pellagra and optic neuritis both were cured, even though alcohol was taken in fairly large amounts daily, because yeast was administered in large doses, thus supplying the necessary quantity of vitamin B₂. In a case of toxic amblyopia due to alcohol, recently observed, vision was improved from hand movements to 20/20 for each eye in a period of two weeks by administering vitamin B₁ and B₂ in the form of yeast tablets, even though some alcohol was taken daily. Carroll reported the same results in a series of cases in 1937, and the present writer quoted Shastid's experience with cases of optic neuritis cured by vitamin B₁ and B₂. In all cases of retrobulbar neuritis, toxic amblyopia, and optic neuritis—whether due to nasal-sinus

infection, alcohol and tobacco, or multiple sclerosis—it would seem advisable to use concentrated yeast tablets to supply large amounts of vitamin B₁ and B₂.

Similarly, in cases of incipient cataract the same therapy should be carried out, for riboflavin (anticataractous for rats) is present in the concentrated yeast tablets. Furthermore, there is sulphur in these yeast tablets (HS-cystine), and some connection between the sulphur content of fish lenses and the prevention of human cataracts has been reported by Shropshire. A further connection between cystine and the formation of galactose cataracts in rats has also been shown; this will be discussed under vitamin C.

VITAMIN C

This vitamin is found in the citrus fruits—orange, grapefruit, lemon, and lime. The pure crystal in the form of cevitamic acid has been prepared.

According to Bellows and Rosner, "In normal eyes the lens and aqueous are rich in vitamin C, in the cataractous lens the amount of vitamin C is diminished or entirely absent, and the aqueous of an aphakic eye contains only a slight amount of this substance. Experiments were performed which showed a definite reduction in the vitamin-C content of the blood in persons with cataract. Furthermore, vitamin C is absorbed from the conjunctival sac into the anterior chamber. Presumably this takes place through the cornea." These investigators also proved that the substance in the lens which reduces a special dye (sodium 2, 6, di-chlorobenzene-indophenol) is entirely vitamin C, and not any other reducing substances such as sulphhydryls. Bellows went still further and showed that the cataract produced in the albino rat by lactose (Mitchell and Dodge, Mitchell and Cook) and by galactose (Yudkin and Arnold) is due to a loss of the sulphhydryl content

of the crystalline lens which can be delayed by cystine and to a lesser degree by vitamin C in this type of cataract. Accordingly, it would seem that in cases of incipient cataract vitamin B₁ and vitamin B₂, to supply the cystine, and also vitamin C should be administered. In the writer's own practice this procedure has been carried out for the past four years, but of course no conclusions should be drawn as yet.

Bietti believes that the decrease in the amount of vitamin C in the aqueous and in the cataractous lens is the result of the lens changes and not the cause. He was unable to prevent or influence naphthaline cataract by administering vitamin C.

In 1932 Szent-Györgyi and Svirbely in Hungary proved that hexuronic acid is vitamin C. At the same time King and Waugh of the University of Pittsburgh showed that a crystalline compound which they isolated from lemon juice was identical with hexuronic acid. Szent-Györgyi found that the best source of vitamin C was the peppers grown in Hungary. However, patients with purpura were relieved by the juice of peppers or of citrus fruits but not by the pure crystalline vitamin C. On further investigation it was found that citrus fruits and the peppers contain a second substance controlling the permeability of capillaries and this substance is called vitamin P. The symptoms of scurvy seem to be due to a lack of both vitamin C and P.

Accordingly, it would seem advisable for ophthalmologists to utilize the juice of citrus fruits in large doses in attempting to control intraocular hemorrhage whether due to trauma (operative or other) or to some metabolic disease such as diabetes. Yudkin recently advocated the same therapy and seemed quite encouraged by its results. The present writer has also tried it in several cases of intraocular hemorrhage, both postoperative

and metabolic, and feels encouraged enough to continue with its use.

VITAMIN D

The use of vitamin D in ophthalmology has been limited to cases of myopia in the hope that this vitamin plus calcium would cause an increase in the amount of calcium in the sclera and thus prevent further stretching. Recently the writer reviewed this subject and gave the results of clinical experiments which showed no favorable influence on myopia after vitamin-D therapy. However, it should be borne in mind that the prescribed dosage of 10 minims daily may have been insufficient. Inasmuch, however, as this is the dosage for cases of rickets we may assume that it is sufficient for cases of myopia investigated clinically. The use of vitamin D in keratoconus has also been suggested.

SUMMARY

It is suggested that in cases of the following vitamin deficiencies it might be

theoretically valuable to prescribe the following treatment:

1. Vitamin A—Prescribe a tablespoonful twice daily in cases of poor dark adaptation, phlyctenular kerato-conjunctivitis, photophobia, and low-grade conjunctivitis in women who are on a slenderizing diet or in cases of other corneal and conjunctival lesions in which the history shows a lack of vitamin-A intake.

2. Vitamin B (B_1 and B_2)—Prescribe eight yeast tablets daily of the brewers'-yeast type put up by any of the reliable pharmaceutical firms, or the powdered form may be ordered. This is to be used in cases of incipient cataract, in optic neuritis, retrobulbar neuritis, and also in toxic amblyopia.

3. Vitamin C—Order the juice of at least two large oranges or one grapefruit daily in cases of incipient cataract. (This is plus the brewers' yeast which is also to be taken daily.) In cases of intra-ocular hemorrhage order the juice of four lemons daily.

136 E. Sixty-fourth Street.

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LECTURES ON MOTOR ANOMALIES*

V. DEVELOPMENT AND COURSE OF STRABISMUS

A. BIELSCHOWSKY, M.D.

Hanover, New Hampshire

The answer is, that the result of the therapeutic procedures depends to a high degree upon the kind of retinal correspondence that is present in the individual case. The prospect of restoring binocular single vision by correcting the faulty position of the eyes will, of course, be much better if the normal correspondence has been proved to be intact. Further, most ophthalmologists will recall patients with alternating squint who had never noticed diplopia but suffered tremendously from it after the squint had been corrected or reduced by operation. The diplopia in some of these cases is a paradoxical one; that is, the distance between the double images points to the difference between the present and the former position of the eyes. Thus, for instance, a patient whose convergent squint of 25 degrees had been reduced to a convergence of 5 degrees will see crossed double images of about 20 degrees; or, if a divergent squint of 30 degrees had been reduced to 5 degrees, will see homonymous double images of about 25 degrees. Sometimes the diplopia disappears after a few days due to a reestablishment of suppression. In other cases the diplopia can be very persistent and cause a good deal of trouble to the patient as well as to his doctor, who might be reproached by the patient for not having told him before the operation about a possible diplopia afterwards. One can prevent such an unpleasant situation by ascertaining whether or not anomalous retinal correspondence has developed dur-

ing the period of squinting. In repeated examinations (which must be made in any case where an operative procedure seems to be necessary), many patients, if tested with afterimages, will find to their surprise that they no longer see the afterimages separated from one another but as forming a cross. This will indicate that the anatomic substratum of normal retinal correspondence, although present, is not functioning under the ordinary conditions of seeing, in which the substitute is more convenient. But in a dark room, where the patient sees nothing but the afterimages, the dormant normal correspondence has a better chance to arouse and maintain itself against or beside the anomalous correspondence. Of course, in using the afterimage test one must avoid any influencing suggestion. The patient must be told, before the beginning of the test, only that he will see a vertical and a horizontal afterimage of the glowing filament and that he must carefully watch the position of both lines relative to each other so that he may be able to reproduce it by means of a simple drawing. If these conditions are fulfilled the result of the test will be unequivocal.

In cases of alternating squint one should not fail to ascertain how the eyes react to simultaneous stimulation of both the foveae by means of the phorometer or, better still, of the haploscope. If simple drawings, such as a circle and a square, respectively, are presented to either eye separately, the drawings will be fused or will cover each other, provided the correspondence functions normally. But in some cases it is very difficult or even impossible to make the patients see both images situated on the

* From The Dartmouth Eye Institute, Dartmouth Medical School. Read before the Seventh Annual Mid-Winter Clinical Course of the Research Study Club, Los Angeles, California, January, 1938.

maculae at the same time. They will see only one of the images either with the right or the left eye, the other image being suppressed (alternating uniocular vision). By shifting the image in the squinting eye, particularly in the vertical direction, it can more readily be brought to the patient's consciousness and it may remain visible for a while if it is now slowly brought toward the macula. But it will disappear before it has reached the latter and, if the shifting is continued very slowly, it will suddenly appear beyond the second image, or below or above it. Occasionally the images may even be made to touch or partly overlap, but one will not attain fusion or a perfect covering of the two images. This peculiar behavior can be explained only by assuming that the patient changes the angle of squint, instinctively trying to find a position in which the images would not be situated on corresponding retinal points, because two identical macular images localized in the same direction without being fused may, in the case under discussion, cause such an uncomfortable feeling that the patient, without knowing it, endeavors to avoid it by changing the angle of squint. To ascertain this behavior before any operation is performed is very important. For, in such cases there will very probably be a disturbing diplopia after the squint is removed or reduced to a minimum. Usually it disappears sooner or later. But one cannot tell how long the diplopia will last in the individual case. Therefore one ought never to omit discussing this possibility with every patient having alternating squint who shows symptoms of anomalous correspondence, and particularly the unsteadiness of the angle of squint just described, which would suggest the phenomenon of horror fusionis. The appearance of this phenomenon depends not unconditionally on the existence of an anomalous correspondence. I have also

seen it in cases in which the double images corresponded perfectly to the small angle of squint that had remained after one or several operations. Horror fusionis may be due to a defective development of the sensorial apparatus in the occipital lobes. In such cases there is neither a normal nor an anomalous but no sensorial correspondence at all because the two eyes of the patient do not present the halves of a single organ, Hering's "Doppelaugen," but two organs which, in regard to the sensorial apparatus, are independent of each other. But such cases, I am sure, are extremely rare. Horror fusionis may be produced by a protracted disuse of one eye, or arise due to a severe nervous shock, and the fusion faculty may be capable of being developed by proper training and a most careful removal of anything that may cause a difference between the visual function of both eyes.

Passing on to the development and the course of the different kinds of strabismus, I am going to discuss, first, the most frequent and, with regard to the therapeutics, the most important form; that is, convergent squint. It arises, as a rule, in early childhood. Only in a small percentage of the cases does it begin after the sixth year, following a disease or injury reducing the vision of one eye; sometimes it is due to a protracted occlusion of one eye, if it had been bandaged for a couple of days. I have seen some cases of this kind, one of them in a boy of 14 years who came to our clinic some time ago because of a chalazion in the right upper lid. After the extirpation the right eye was bandaged for two days. When the eye was uncovered he complained of diplopia. There was a manifest convergent squint of 18 degrees. The double images were uncrossed and their separation subtended exactly the objective angle of squint. He had a hyperopia of 5 diopeters, which had never been corrected, since

the boy had full vision of both eyes and had never noticed any trouble previously. His brother had been operated on for permanent convergent squint two years before. Even after atropine had been given and the refractive error had been corrected the deviation did not disappear. But when the retinal images were shifted from the disparate to corresponding points by means of prisms or the haploscope there was fusion with depth perception; in addition, an unusually high amount of aniseikonia was determined by Professor Ames. The images of the two eyes could be equalized by meridional size lenses of 8 percent axis 90 degrees before the right and 6 percent axis 180 degrees before the left eye. The patient had binocular single vision when he wore before each eye a combination of $+4.00$ and 10^{Δ} , base out, with an aniseikonic correction in a temporary frame. After three days he reported that he had broken the glasses which were in the left side of the trial frame, but nevertheless he had binocular single vision when wearing just one set of glasses before the right eye. I found the convergent squint reduced from 18 degrees to 5 degrees. The aniseikonia was likewise reduced considerably. There was still spontaneous diplopia but, in order to get binocular single vision he needed only 2^{Δ} , base out, before each eye in addition to the hyperopic correction. After three days he discarded the glasses, since he had found that he had binocular single vision without them. When examined he showed an esophoria which, after suspension of fusion, became manifest and gradually increased up to 9 degrees with and without the glasses correcting the hyperopia. Vision was 20/15 with and without the glasses.

The case is a very instructive illustration of the different factors which have been discussed as being responsible for the development of squint and particularly of the decisive role played by the

fusion apparatus in the etiology of squint. The combination of three important etiological factors—namely, inherited disposition, excessive accommodation induced by hyperopia of more than 5 diopters, and a considerable esophoria based on an anomalous position of rest—brought about neither a permanent nor even a periodic convergent squint as long as it was counteracted by the fusion apparatus in the interest of binocular single vision. But why did the fusion apparatus fail to overcome the tendency to squint for a considerable length of time after the bandage had been removed from the right eye? Since the correction of the hyperopia did not reduce the angle of squint more than a few degrees, it is evident that in this case the excess of accommodation was an etiologic factor of less importance than the convergent position of rest which, according to the results of later examinations, amounted to 9 degrees; that is, half the angle of the convergent squint which was found after the removal of the bandage. The other half is to be attributed to an excessive convergence innervation due, very likely, to so-called diplopiaphobia. It is not unusual that a person, noticing double images for the first time and trying to fuse them without success, will find instinctively that the double images are less disturbing if their separation is increased. The only voluntary innervation which may serve that purpose—by altering the position of the eyes relative to each other—is the convergence innervation. Whether or not diplopiaphobia plays such an important role in the etiology of squint as some authors (Duane, van der Hoeve) believed, is still an open question. In my opinion a convergent squint is to be attributed to diplopiaphobia only in a comparatively small number of cases. Our patient's convergence spasm subsided gradually when about half of the deviation was compensated for by means of prisms. The re-

maining half was overcome by the patient's powerful fusion apparatus. Without going into details of this most interesting case, I just want to mention the fact that the high amount of aniseikonia that was found during the period of convergent squint decreased almost exactly in proportion to the decrease of the deviation. At present, as soon as the latter is again evoked and brought up to the previous amount by an adequate haploscopic arrangement, a corresponding increase of the meridional aniseikonia is reestablished.

The results to be expected from a rational treatment in cases in which convergent squint has arisen relatively late, are much better than in the other group because of the existence of a fully developed normal retinal correspondence. Of course, the attainment of the ideal result, the restoration of binocular single vision depends also in these cases on the vision of the squinting eye. If an existing amblyopia can be improved, fusion exercises by means of the phorometer or the haploscope or other orthoptic apparatus will, in such cases, have the very best chances, sometimes even without any operation; for instance, in cases in which an original esophoria had been transformed into a manifest convergent squint in consequence of an occlusion of one eye. In the main group, patients with a convergent squint existing since early childhood, the ideal result—namely, binocular single vision—can be obtained in only a much smaller percentage of the cases. That is due partly to the frequent amblyopia of the squinting eye, partly to a persistent anomalous correspondence or a deficiency of the fusion apparatus, either congenital or acquired in earliest childhood, so that very frequently one must be satisfied with the removal of the cosmetic disfigurement. The earlier the squint can be treated the better the prognosis. By bandaging the fixating eye for weeks or

months a considerable improvement of the vision of the squinting eye may be achieved if the amblyopia is not of an organic but of a functional origin. The second task in such a case—a careful correction of any refractive error is presupposed—would be to overcome the suppression tendency of the squinting eye. To accomplish this the child must be at least three years old or more, so that it can tell about the double images and the images seen in the stereoscope or amblyoscope. It is not very difficult to find out whether the position of the double images relative to each other is due to an anomalous or to the normal retinal correspondence. In the latter case one may try to obtain fusion by means of prisms; Sattler reported very gratifying results in this way even when he had to prescribe prisms up to 20^A for either eye. Their strength can be reduced after some weeks or months if fusion is obtained. If not, suppression and amblyopia of the squinting eye will return unless the occlusion of the dominant eye is continued.

In cases of a constant deviation of more than 20 (arc) degrees, when a complete relaxation of accommodative effort, first by means of atropine, then by a full correction of hyperopia, has failed to bring about any improvement in the condition or has removed only a small fraction of the deviation, an operation must be considered. As to the earliest age at which a child with a convergent squint can be operated on, definite rules cannot be given. The patient should not be operated on before glasses, possibly combined with prisms, have been worn for several months and the angle of squint has been found to be rather constant during repeated examinations. In quite a number of cases the squint decreases gradually and, while the children are growing, finally disappears, mainly because of the change of the topographic anatomic conditions which favor the tendency of the

eyes to diverge. As long as a decrease of the angle, even though it be small, can be ascertained, one should wait. But if an angle of more than 10 (arc) degrees is the same after six months of observation, or has possibly increased, I do not hesitate to operate on a child of about four years of age. The older the patients, the sooner an operation may be performed after the angle of squint has been found to be fairly constant in repeated examinations and after the nonoperative procedures have been tried without success. The prospects for these procedures will be better after the angle of squint has been reduced to a small fraction, provided that the amblyopia or a defective condition of the fusion apparatus does not present insuperable obstacles. There are cases in which binocular single vision and depth perception together with a certain amplitude of fusion sets in immediately and spontaneously after the operation. But in the majority of cases in which any good result is to be obtained at all, it takes some time until binocular single vision can be demonstrated after the angle of squint has been reduced to a residue of a few degrees by operation. Fusion training might help a good deal, but in the end it will depend on the condition of the cortical centers governing the fusion apparatus whether the functions of *perfect* binocular single vision, including depth perception and fusional amplitude, will be obtained or just fusion without depth perception or fusion only for near and not for distant objects because of a deficient fusional amplitude. These patients, as a rule, do not notice diplopia, availing themselves of the faculty acquired during the previous squint to suppress the images of one eye. The functional deficiency of the fusion apparatus can be improved by exercises only if it does not depend on a defective condition of its cortical centers. But even cases in which all the symptoms point to a con-

genital deficiency of the fusion apparatus may be cured by proper treatment, thus proving that they are functional anomalies, as in the following two examples.

A student, 20 years old, unusually ambitious and industrious, had been operated on three times by one of the most prominent ophthalmologists on account of a convergent strabismus that had arisen in earliest childhood. Seven weeks after the last tenotomy, diplopia developed to the great annoyance of the patient. He was a big, strong fellow, and apart from a very pronounced neuropathic habitus, perfectly healthy. Both refraction and vision were normal. There was a permanent convergent strabismus of 2 degrees for distance, but the double images were alternately homonymous and crossed, fluctuating greatly, up to an amount of 10 degrees. Apart from the convergent deviation the right eye was turned upward, the amplitude also fluctuating between 2 and 14 degrees, but the objectively measured vertical deviation always corresponding to the vertical separation of the double images. There was no sign of a parietic anomaly, the angle of squint being independent of the direction of view. All attempts with prisms and haploscope to get the double images fused failed, due to the continual changes of the angle of squint. Because of these conditions and in view of the very small deviation I doubted whether I should be able to relieve the patient of his diplopia; but since he insisted on my making a last attempt to remove his troubles I advanced his left external rectus, producing as an immediate result a divergence of 10 degrees. It decreased gradually and was finally transformed into a convergence of 2 degrees; that is, the same amount as before the operation. But the vertical divergence had disappeared and did not return. The horror fusionis remained, the patient saw now crossed, now uncrossed double images that could not be fused and were

annoying to such a degree that the patient after a month earnestly asked to have his original squint restored in order to be able to continue his studies. But I finally succeeded in persuading him to wait six weeks longer and to submit to regular stereoscopic exercises. Gradually, the fusion faculty was developed so that after six weeks the patient noticed double images only of small objects contrasting with the background, and at last acquired even a certain amount of depth perception. The ophthalmologist who supervised the exercises told me that during the exercises the patient always had to overcome enormous psychic inhibitions. He gave the impression as though he were actually looking for double images, but fortunately no longer found them.

This case is interesting in some respects. It confirms the experience gained in other cases of vertical divergence which, if they are due to intermittent nervous excitations should not be operated on, because they may disappear without any particular treatment if restoration of the fusion faculty can be achieved. It confirms the rule, the importance of which I have emphasized time and again that, in the face of apparent failures of squint operations, to the performance of which no objection could be raised, one must not be induced, in such cases, to precipitate procedures which would spoil the effect of the operation. One has to remind the patient that he must endure the troublesome condition for at least two or three months and that he must await the results of exercises. Finally, the case demonstrates that horror fusionis may not be caused by a congenital defect but may be due to a neurotic disturbance and can be cured even if it has existed for years and in spite of the various kinds of treatment that have been tried unsuccessfully.

Another extremely interesting case of

horror fusionis was demonstrated by me at the meeting of the New England Ophthalmological Society in January, 1935, and was published in my article on "Congenital and acquired deficiencies of fusion" (*American Journal of Ophthalmology*, 1935, volume 18, October). The case has, in my opinion, a fundamental significance. The patient, who had been operated on several times on the lateral as well as the vertical ocular muscles because of a complicated squint, showed a slight deviation composed of a lateral, a vertical, and a torsional component, changing with the slightest alteration of view because of a paretic weakness of almost all the muscles of the right eye. There was, according to the direction of gaze and the position of the head, homonymous or crossed diplopia with positive or negative vertical divergence and conclination or disclination of the vertical meridians. Even for one and the same direction of gaze the deviation was very unsteady, due to spasms of the convergence and the vertical divergence innervations. Fusion could not be obtained by any method. Only after an unusually high amount of aniseikonia had been determined, and corrected by size lenses, could binocular vision with depth perception and a certain fusional amplitude be established. Aniseikonia has to be looked for in every case of weak or defective fusion because it may be an important etiologic factor, not only in so far as it involves an incongruence of the ocular images (such as ametropia or other conditions impairing the visual acuity), but because it may produce anomalous and nervous irritations as well as a weakening of the physiologic fusion mechanism, either in its sensorial portion by favoring suppression, or in the motor portion by checking the fusion innervation, on account of a mental antipathy toward the fusion of heterogeneous ocular images.

PARALLEL STUDY OF THE PATHOGENESIS OF RHINOGENOUS OPTIC NEURITIS AND OF SEROUS IRITIS

BÉLA WALDMANN, M.D.
Oradea (late Nagyvárad) Roumania

In the last score of years, the American medical literature has subjected the question of retrobulbar neuritis to a thorough study, but it is evident that opinions as to the origin of this disease are still divergent.

In 1906 I was so fortunate as to be present at the meeting of the Society of Hungarian Oculists, before which Onodi demonstrated for the first time his world-renowned preparations. He made a very deep impression on his audience and aroused their profound interest in this problem. His address was of great interest to me, and under its influence, during the course of the last three decades, I have paid especial attention to all those cases that could be brought into causal connection with the accessory nasal sinuses. Thus I have acquired a considerable amount of data which have now encouraged me to essay the solution of the pending questions from my own experience.

The relation of single cases of iritis to the mucous membrane of the nose was first mentioned by Ziem in 1887; namely, he observed in three instances that the iritis underwent a considerable improvement upon treatment applied to the simultaneously existing rhinitis. Kuhnt denied the possibility of the causal connection, and attributed the improvement to the fact that the cauterization of the mucous membrane of the nose, in a collateral way, diminished the hyperemia of the uvea, and thus brought about the improvement. The conflicting opinion of this prominent ophthalmologist buried the question until the present day, although, as will be apparent from the following comments, it well deserves a careful study.

A. OPTIC NEURITIS

Before entering into the discussion of the pathogenesis, I shall describe some types out of my own collection of cases, selecting those that are apt to support my conception.

Type 1. M. L., a female, aged 46 years, consulted me on March 29, 1928, complaining that six days ago she had gone to bed with perfect sight and next morning, upon awakening, noticed that she saw nothing with her right eye.

Examination: No objective vision in the right eye; light perception good. Vision in the left eye 5/5. Both eyegrounds were wholly normal. Suspecting that this might be a case of hysteria, I made control examinations which, however, yielded a negative result. The nervous system was unimpaired; a blood test, negative.

Diagnosis: Neuritis retrobulbaris.

Rhinoscopy: No secretion could be seen on the right side on account of hypertrophy of the turbinate. X-ray report was negative. Upon my strong recommendation next day the middle nasal turbinate was resected and the ethmoidal cells opened, whereupon abundant, purulent secretion was evacuated from all their sections and even from the sphenoidal recess. Subsequent to the operation vision rapidly improved and, after the lapse of two weeks, became completely normal.

Comment: In the present case the X-ray report was of no avail, and although vision had been rapidly reduced to the minimum, the eyegrounds displayed nothing abnormal. This form presents the most favorable prognosis, visual recovery taking place in a fairly short time.

Type 2. S. E., a female, aged 36 years, called on me on January 4, 1928, with the complaint that her sight in the left eye had abated during the last few days.

Examination: Vision in the right eye 5/5, in the left 5/30; in the left fundus the outlines of the papilla were indistinct, the blood vessels tortuous.

Diagnosis: Intraocular optic neuritis; that is to say, a mild papilledema. The nervous system was unimpaired; blood test, rhinoscopy, and X-ray studies were negative. Notwithstanding, I daily placed cocaine-adrenalin swabs into the left nasal meatus. Although this procedure resulted in the continuous evacuation of a pro-

fuse, muco-purulent secretion, vision nevertheless gradually became so reduced that on the 28th of January the patient could only count fingers from a distance of half a meter. Then I urged the opening of the ethmoidal cells, and it was found that the mucous membrane of the left ethmoidal sinus showed polypoid degeneration. From the day of the operation the sight gradually improved and on the 18th of April it had become 5/7. Four years subsequently the same process was repeated in the other eye, following a similar course.

Comment: From this case, which represents the moderately severe form, the lesson can be drawn that the failure to obtain results by applying swabs by no means disproves the rhinogenous origin of the neuritis, but, on the contrary, in such instances an operation is urgently indicated.

Type 3. M. I., a female, 21 years of age, consulted me on December 22, 1937, complaining about considerably impaired vision in her left eye.

Examination: Right eye unimpaired; in the left fundus the papilla was greatly elevated (3 D.), its outline wholly blurred, but the filling of the blood vessels scarcely deviated from the normal.

Diagnosis: Papilledema in a high degree. Vision from a distance of 2 meters is ability to count fingers. The blood test was negative; rhinoscopy revealed the presence of abundant purulent discharge in the middle meatus. I suggested to the patient to have her nose treated, but owing to the approaching Christmas holiday she refused to do this and went home. In five weeks' time she again appeared, her vision having diminished to counting fingers at half a meter, and the optic nerve was by way of becoming atrophied. She refused to undergo treatment at this time also.

Comment: This case represents the most serious form of optic neuritis; namely, one in which the elevation of the disc is pronounced. The fibers of the optic nerve are very sensitive to pressure and quickly atrophy.

PATHOGENESIS

It is unnecessary to mention in detail the pertinent American literature, and I shall therefore confine myself to enumerating only those authors whose writings have been accessible to me; namely, W. L. Benedict, E. Campbell, C. Crane, S. Gifford, L. White, and the medical staff of the Johns Hopkins Hospital under the direction of A. Woods. Although these writers have brought the very best of

their knowledge to the clearing up of this question, yet according to the results of H. Campbell the opinions are so contradictory that they may be conducive to considerable confusion in the reader. Some authors regard the disease of the optic nerve to be a septic focus originating in the teeth or the tonsils. A considerable number of ophthalmologists hold that the provocator is the collateral edema, and there are only a few who take for granted that the source of the affection is in the pressure conveyed through the thinned bony separating wall. The assumption that the inflammation in the canal is brought about by the direct spreading of the infection from the sinus has most adherents. This thought gained strong support in the discovery of Herzog, according to which the medullary cavities in the bony wall of the accessory sinuses lead directly towards the mucosa, likewise towards the dura mater, and thus provide a direct path for the passage of the causative agents. Hajek also concurred in this concept of Herzog, but in my opinion this cannot be applied in cases of optic neuritis, but only in those of serous iritis, and for the following reasons:

First: If pathogenic agents were to penetrate into the optic canal, their propagation would not be restricted to the canal, but they would migrate farther either into the brain or into the eye, where they would provoke an inflammation such as we generally see at postmortem examinations of those cases of serous iritis and sympathetic ophthalmia in which the uveitis of the fellow eye was preceded by an optic neuritis, as was shown by the animal experiments of the younger Velhagen. To my knowledge no mention has been made in the literature of such an instance of optic neuritis of rhinogenic origin followed by uveitis.

Second: In optic neuritis the pathogenic agent could not even migrate from the diseased sinus, for in my cases, as also in those under the observation of Campbell and Gifford, rhinoscopy often established a diagnosis of chronic hypertrophic inflammation, or empyema. In these cases the strepto- and staphylococcus, and, according to the finding of James J. Moore, even the *Bacillus pyocyaneus* may be encountered in the accessory cavities. Against this peril the organism raises a defense, preventing the escape of these dangerous pathogenic agents into the canal by forming a defensive wall; for otherwise most individuals suffering from empyema would die of meningitis. According to Hajek the edema in such cases is restricted only to the upper strata of the mucosa, while the rest down to the periosteum become transformed into a coarse, fibrous connective tissue. White histologically examined nine cases and similarly found a fibrous thickening of the mucosa which sometimes involved even the bone. According to my own observations, this is a dam that is impervious to the pathogenic agents; therefore, they cannot play a role in bringing about neuritis, and the whole process may be regarded as aseptic.

Thus, in bringing about optic neuritis the following two factors may play a part: either direct pressure, or collateral edema.

In a closed empyema it is easily possible, that in connection with the disintegration of the mucosa and its purulent necrosis, gases of decomposition develop that may be conducive to the tightening of the bony wall. If the latter is thinner than normal and at the same time the abnormal course of the canal brings it nearer to the sinus, the rise of pressure in the cavity may be directly conveyed through the bony wall to the soft tissues in the canal. Thus these may suffer compression and give rise to the various

grades of neuritis: (a) in mild compression, retrobulbar neuritis (normal fundus); (b) in moderate compression, intraocular neuritis; (c) in compression of a higher degree, papilledema.

The clinical symptoms of the cases I have described indicate the existence of these three grades.

Besides the enumerated American authors, the role of the collateral edema has been corroborated also by Traquair, Letchworth, and recently by Sakaye Kitahara, who says that in the neighboring formations this is produced by the purulent imbibitions of the sinus. To this edema can be traced those cases in which the deterioration of vision sets in suddenly; similarly rapid, also, is its return, as was noted in my case, type 1. An edema may appear in such a short time, but not the disturbance caused by the intrenched pathogenic agents.

By the aid of roentgenograms, L. White established the existence of canals of different gauges; in general, the calibers were of 4 to 6 mm., and from this he drew the conclusion that canals of narrower caliber are more apt to promote the occurrence of neuritis than those that are wider. Apart from the fact that the roentgenograms of the accessory cavities, in general, are disappointing, I consider White's conclusions to be erroneous, for the fluid in the intervaginal cavity compensates for the 1 to 2-mm. difference, the space of the canal being filled in every instance. Thus the pressure exerted upon its wall, or the edema occurring in it, in the same way creates a narrowness of space, whether its caliber is 4 or 6 mm. Besides, Endre Luzsa* on the basis of numerous screening examinations states that roentgenograms taken of one and

* State Eye Hospital, Budapest; Director, Professor Imre.

the same canal at different planes may display various dimensions, because an infinitesimal change in the position of the tube, of the film, and of the skull is apt to influence the outlines of the shadow, and therefore we cannot obtain absolute values. For this reason I shall not follow White's advice—namely, that nasal treatment is superfluous in the case of canals of 5 to 6-mm. diameters—because according to him, the optic nerve is not endangered, and spontaneous recovery can be awaited without risk.

From the foregoing it can easily be explained why rhinogenous optic neuritis is so rare, although the inflammation of the accessory cavities is of frequent occurrence. This is emphasized by several authors as a counter-argument to the theory of those who believe in the rhinogenous origin of single neuritises; namely, that for the development of an optic neuritis, two conditions are necessary: first, the abnormal thinness of the bony separating wall; second, an anomaly in the course of the optic canal which brings about a closer relationship between the optic nerve and the adjacent sinus,** and thus direct pressure, or the evolution of a collateral edema becomes possible. As the simultaneous presence of these two anomalies may be regarded as rare, accordingly also optic neuritises connected with them are strikingly rare, but this does not justify a doubt as to the existence of this pathologic form. Thomson also acknowledges optic neuritis to be a relatively rare disease, but he accentuates its great importance, requiring quick and energetic treatment.

Thus it is not justifiable to omit or postpone the treatment of the accessory cavities because in some cases the condition

healed spontaneously. According to Hajek, a partial or entire impediment to the evacuation of the secretion forms one important cause of the chronicity of the sinus affection. In this the composition of the secretion is significant, for according to him a thick discharge may be impeded even if the efferent duct is fairly wide. It is no wonder, therefore, that in optic neuritis, in the presence of a closed empyema, radical operation in the nose must often be performed because the swab had proved unsatisfactory. This was realized in my example of type 2, which, on the other hand, was under my constant control during the latter 10 years and in spite of the fact that optic neuritis occurred on both sides, no symptoms of multiple sclerosis were present. On the other hand, Meller believes that if, subsequent to an optic neuritis, a multiple sclerosis should make its appearance, even after the lapse of some years, the previously established rhinogenous origin could not be doubted at all.

The detrimental result of procrastination is vividly illustrated in the following data, compiled by Tibor Bajkay in 1937, from the Budapest Oto-Rhino-Laryngological Clinic. They operated upon 54 patients for retrobulbar neuritis, in 29 of whom there was a positive rhinological finding. In every one of these the posterior sinuses had been opened. Of those with positive rhinological findings, 5 fully recovered, 21 improved, and 3 remained uncured. Of the number of those with negative findings, 4 were cured, 15 improved, and 6 remained uncured. It was furthermore well established that patients who presented themselves 3 to 4 days after deterioration of the vision had set in, achieved full sight, whereas for those who presented themselves only after 8 to 14 days, the operation resulted in only an improvement. The nine patients whose condition was not improved by the operation,

** On the occasion of Onodi's demonstration I saw four such preparations in which the optic canal ran a course in one of the posterior sinuses to a length of 6 to 10 mm.

presented themselves for treatment after a lapse of two weeks.

Among their data a contralateral case was also described, in which a rightsided ethmoiditis gave rise to the occurrence of a retrobulbar neuritis on the left side and in two weeks, subsequent to the cleansing of the sinus in question, the eye healed with full vision. An anatomical preparation, corresponding to this case, was among the slides demonstrated by Onodi, which I had the pleasure of seeing.

S. R. Gifford in a relevant discussion writes: "In spite of the floods of ink that have been spilled on this question during the past 10 years, it is still decidedly a question and may be resolved into three principal parts: In what percentage of cases of retrobulbar neuritis is sinusitis the cause? Can retrobulbar neuritis be caused by the disease of the sinuses giving no evidence on rhinologic or roentgenologic examination; if so, what is the pathology of the disease of the sinuses? In the presence of retrobulbar neuritis with no apparent cause and with no nasal evidence of sinusitis should one advise exploratory operation on the sinuses?"

In regard to the first question I believe that the relevant statistics are not conclusive, because there is yet no consistent decision as to the rhinogenic origin of neuritises and therefore as many statistics are compiled as there are points of view upon which they are based. Suffice it to say that neuritis of rhinogenous origin is a rare disease, but that it does occur.

To the second question I can give an answer on the ground of my own cases. In every such case, when per exclusionem the origin of an optic neuritis can be located only in the accessory cavities, there is the possibility of a closed empyema even if the nasal and X-ray findings are negative. Therefore, in such instances—and this is the answer to the third ques-

tion—the explorative opening of the posterior sinuses is imperatively necessary.

B. SEROUS IRITIS

In 1929, 10 cases of serous iritis came under my observation, and by chance I found that a nasal swab soaked in cocaine-adrenalin solution was apt to bring about a striking improvement. I dealt with this topic at length in an article which appeared in the *Zeitschrift für Augenheilkunde* in 1930. This publication did not provoke much comment, and for this reason I again call the attention of ophthalmologists to this important fact. Prior to entering into the explanation of the pathogenesis, I shall describe various types from the cases I have observed.

Case 1. S. N., a female, aged 68 years, called on me on May 1, 1928, with the complaint that for one week her right eye had been inflamed.

Examination: There was an explicit serous iritis in the right eye; the fundus was invisible. The left eye was normal. A blood test proved negative.

Some weeks previously she had had a cold. The described ocular condition persisted with unvaried intensity for three weeks, associated with tormenting headaches, and at this time a mild iritis supervened also in the fellow eye, preceded, two days previously, by a neuritis. Because of the tendency of the pupils to dilate I dropped seopolamine into both eyes once a day only. Then I told the patient to consult a rhinologist, who established the presence of a chronic rhinitis and deviation of the septum. On the left side the nose proved normal. On the right side I applied cocaine-adrenalin swabs daily, whereupon the inflammatory phenomena as well as the precipitates, likewise the tormenting headache, showed a quick and striking improvement, and by July 8th both eyes had recovered with full vision. Meanwhile, when the precipitates disappeared and the fundus could be examined, a markedly developed optic neuritis could be observed in the primary eye also.

Comment: As will be seen from the description, in the primary eye a serous iritis made its appearance, followed later by an optic neuritis, and after the lapse of 25 days serous iritis supervened also in the other eye, having been preceded, by some days, by an optic neuritis. The fact that the condition of the primary eye in spite of the customary treatment gradually deteriorated until nasal treatment was begun,

and that from this time on a striking recovery was set in motion, and also that the torturing headache abated, authorized me to designate this bilateral iritis as of rhinogenous origin. For it is plain that the abatement of the severe symptoms, the elimination of the precipitates, and regression of the optic neuritis cannot by any means be attributed to the once daily administered scopolamine solution, but could be ascribed to the nasal treatment.

Case 2. H. E., a female, aged 22 years, had had a cold some weeks previous to her calling on me on the 14th of November, 1928.

Examination: Right eye normal; in the left eye a severe serous iritis.

Atropine was prescribed to be administered five times daily. The tuberculin test was negative; the blood Wassermann test positive.

Nasal finding on the 28th of November: rhinitis on the left side. These tests lasted for 14 days, during which time the condition of the eye, in spite of the energetic atropinization, gradually became worse, violent headaches supervened, and the precipitates greatly increased. Then, encouraged by the good results achieved in the first case, I resolved to try, instead of an antisyphilitic cure, treatment of the patient with only cocaine-adrenalin swabs. This resolution was prompted by an older statement by Römer, in which he said that even in case of positive blood test every iritis need not be regarded as syphilitic. The cocaine-adrenalin treatment was successful, inasmuch as after a few days the pains abated and the inflammatory phenomena of the eye considerably subsided, so that by the 28th of December I was able to examine the eyeground, which proved to be unimpaired; vision was 5/10. At this time the inflammatory symptoms were only moderate. In 10 days, however, the patient returned with the surprising statement that a few days before, the other eye also had become inflamed, while the condition of the primary eye was aggravated. Upon my interrogating her, she confessed to have neglected the nasal treatment for several days, in view of the improvement that had set in.

Examination: Well-developed serous iritis bilaterally with copious precipitates. Temperature 37.4°C. Nasal finding: The rhinitis present on the primary side displayed a vigorous recurrence. With adequate nasal treatment and with the administration of atropine both eyes recovered with full vision by the 9th of April. After the disappearance of the precipitates the eyeground examination, carried out meanwhile, showed both papillae to be intact.

Comment: From this description it is clear that in an individual, strongly syphilitic, a bilateral serous iritis supervened in an interval of several weeks, and in spite of the omission of antiluetic treatment, tamponade of the nose led

to a complete cure. It is a striking circumstance that inflammation supervened in the other eye only when the patient, at the time when there was considerable improvement of the primary eye, neglected the nasal treatment—as superfluous—and in this way the rhinitis became exacerbated. As, however, the optic nerve remained unimpaired during the entire duration of the disease, I would conclude that in the present case the transmigration of the pathogenic agents was by way of the ciliary nerves.

Case 3. T. M., a girl of 15 years, suffered in September, 1928, from a bad cold in the nose with copious secretion. Some weeks later, when these symptoms had passed, the right eye began to be inflamed, and in three weeks the left eye also. She came to consult me on the 6th of December, until which time she had had no treatment whatever.

Examination: Well-developed serous iritis on both sides with abundant precipitates. Vision in the right eye was reduced to the ability to see hand movements, and in the left eye to the ability to count fingers at a distance of one meter. The girl was poorly developed, her skin pale. Twelve of her 13 brothers and sisters had died. The Wassermann test was positive.

Rhinological findings: Rhinitis chronica et sinusitis ethmoidalis on the right side. In the present case—for the sake of comparison—I entirely omitted the treatment of the nose and besides the administration of atropine I confined myself to applying antiluetic treatment. From the time of admission until the 11th of March she received 18 injections of bismuth and 8 of salvarsan. In spite of this the precipitates, forming a mass on both corneae, scarcely diminished, although the inflammatory symptoms of the eye subsided. As the antiluetic treatment, carried on for 90 days, proved to be of very little avail, I stopped it and instead commenced the tamponade of the nose, the more so as meanwhile epistaxes occurred. Upon the application of this method the dwindling of the precipitates was accelerated, so that by the 20th of April the vision in the right eye had risen to 5/20, of the left eye to 5/15. It could now be seen that both papillae were normal. The patient was obliged to leave for family reasons, taking with her adequate instructions for steam inhalations.*

Comment: As can be seen from this case the antiluetic treatment continued for 90 days influenced the healing of the eyes only negligibly, whereas a striking success followed nasal treatment continued for 35 days. It can, therefore,

* A pot of 300-400 c.c. capacity is filled with boiling camomile-tea solution, and covered with a paper funnel, the tip of which is fitted into the nostril.

be stated that serous iritis, even in the presence of a strongly positive Wassermann test, also may be of rhinogenous origin.

Case 4. B. L., a female, aged 35 years, consulted me on November 3, 1937, on account of dim vision in her left eye.

Examination: The right eye was normal; the left eye entirely devoid of inflammation, with bulbar conjunctiva white, the cornea sound. However, in the aqueous chamber, scarcely noticeable, tiny precipitates could be observed.

Diagnosis: Cyclitis. Upon inquiry, she asserted that during the last 15 years she had received antiluetic treatment on several occasions; and that now for one week she was again being treated. Under the circumstances I did not think of a rhinogenous origin. As, however, the eye became strongly injected on the next day, the precipitates increased, and the inflammatory symptoms of the iris displayed during the course of the next 10 days a gradual aggravation, I insisted on rhinoscopy. The presence of a subacute rhinitis of the left side was found. For this reason, I forthwith applied cocaine-adrenalin swabs, a treatment that was conducive to the rapid subsidence of all inflammatory signs and the striking disappearance of the precipitates, so that within the following 10 days complete recovery ensued. According to the statement of the patient, the effect of the tamponade was to cause an abundant thick discharge to be evacuated from that side, through the nostril as well as posteriorly, which she had failed to observe up to that time.

Comment: Serous iritis broke out while antileptic therapy was in course of being administered. It gradually became aggravated in spite of vigorous atropinization; but upon the introduction of nasal treatment full recovery was effected within a short time.

Case 5. E. P., a female, 20 years of age, consulted me on the 5th of May, 1932, complaining of an inflammation of the right eye of a week's standing. I found a severe serous iritis, with copious precipitates. The patient was pale, emaciated, and the internal and screening examinations established the presence of an apical catarrh. Rhinoscopy revealed the presence of a severe rhinitis on the right side. As an experiment I ordered nasal tamponades, on the assumption that perhaps the presence of tuberculosis does not exclude the nasal origin of serous iritis just as had been the case in the presence of syphilis. I was not disappointed, for upon the administration of nasal treatment all the phenomena of the inflammation disappeared at an astonishingly rapid rate, and the patient regained full vision within eight days, by the 13th of May.

Comment: As is evident from this case, serous iritis may be of rhinogenous origin also in the presence of tuberculosis and independent

of the Koch bacillus. This I had declared to be possible as early as 1930.* My concept was corroborated by Löwenstein of Vienna (1936), who, on the basis of an experience of 35 years and of 34,000 examinations, made the statement that "the mere presence of the Koch bacillus does not necessarily indicate that it was the etiologic agent."

Case 6. A. K., a male, 24 years of age, was admitted on the 17th of November, 1937, complaining that his left eye had been inflamed for a few days and that previous to this he had suffered from rhinitis.

Examination: There was serous iritis of the left eye in the absence of lues and tuberculosis.

Rhinoscopy: A chronic rhinitis of the left side was found. Atropine and a nasal tamponade were administered, with but moderate improvement. By the 22d of December he had recovered completely. As soon as the precipitates had sufficiently disappeared, I examined him with the ophthalmoscope and to my surprise observed a moderate optic neuritis, which afterwards gradually regressed.

Comment: The importance of this case lies in the fact that only one eye was affected and yet optic neuritis appeared, which later wholly disappeared with the outstanding symptoms of iritis. It might be concluded that nasal treatment administered in time gradually stopped the reserves of the pathogenic agents migrating from the sinuses into the uvea. Thus the iritis extending to all three parts of the uvea began to regress even prior to the ascending neuritis having extended to the other eye through the lamina cribrosa. This is what took place in case 1, in which I began the nasal treatment only on the twenty-third day, when the fellow eye had become inflamed. Thus I observed—for the second time within 10 years—an ascending optic neuritis of the primary eye in connection with iritis.

It is therefore desirable that every serous iritis be subjected to ophthalmoscopic observation, and if this were done, perhaps my relevant observation will not continue to remain isolated in the literature.

On the other hand, the results in this sixth case indisputably point to the analogy between serous iritis and sympathetic ophthalmia.

I stated this analogy in full in 1937** and in order to disperse doubts I shall supplementarily report further data which I have recently discovered in the literature, and which I had not yet utilized in

* Zeitschrift für Augenheilkunde, 1930, and Archiv für Augenheilkunde, 1935.

** American Journal of Ophthalmology, 1937, v. 20, p. 618.

my writings. In chronological order A. v. Graefe was the first to give expression to the assumption that in a bilateral spontaneous uveitis the disease of the secondary eye supervenes under the influence of the primary eye.

Professor Schnabel, Vienna, 1902, one of the most prominent ophthalmologists of his time, who analyzed the pending questions of pathogenesis with an impartial and irresistible logic, rigidly adhered to the assumption that spontaneous uveitis and sympathetic ophthalmia are identical and denied the exclusive ability of injuries to bring about the latter disease. According to him sympathetic iridocyclitis as well as spontaneous iridocyclitis are produced by the same pathologic agent and in both of the latter this originates somewhere in the human body and reaches the uvea by the same route in both of these pathologic forms.

Elschnig, 1910, formulated his opinion on this subject, as described by Peters, as follows: "... and as regards the relation of sympathetic ophthalmia to spontaneous iridocyclitis, in this matter Elschnig repeatedly accentuated the identity. The simultaneous morbidity of the two organs is an evidence of its constitutional origin. If the two eyes succumb with a certain interval between, the inflammation of the secondary eye originates from the primary eye."

Finally, Meller in 1915 wrote as follows: "Idiopathic* uveitis is the same pathological form which we know of old as sympathetic ophthalmia. . . . Therefore, we should rather refrain from adhering too much to the term sympathetic ophthalmia, which we have failed to substitute with another term, up to the present, because without knowing the path-

ologic agent this is aimless."

After these preliminaries I hope it will cause no special inconvenience to the reader, if in dealing with the pathogenesis in one case I resort to the term "spontaneous iritis" and in another to "sympathetic ophthalmia," these two pathologic forms being identical; the difference between the two is only as to their etiology.

PATHOGENESIS

Serous iritis is an affection of a much greater importance than optic neuritis, on the one hand because it can be observed in a much greater number of cases than can the latter, on the other hand because it is often bilateral and therefore the neglect of adequate therapy is liable to result in a serious disability.

Ten years have passed since the publication of my first treatise, during the course of which I have had numerous cases of serous iritis under my care, and the conviction has grown upon me that this is a wholly separate affection that is caused by a specific agent and is independent of syphilis as well as of tuberculosis. In every case, two weeks prior to the affection of the eye, a catarrhal infection had occurred which ran a mild course and was confined chiefly to the upper respiratory passages, the patient being bedridden for only a day or two, if at all.

I was able as well to establish that in certain years only 1 to 2 cases occurred while in others 10 to 15, usually when a mild endemic influenza was prevalent in our city. My serous-iritis cases presented themselves, without exception, in the season October to April; accordingly I would call it a *seasonal disease*.** In this respect my opinion gained fresh reinforcement in the data of Broman Tore, according to whom 120 violent iritises

* The term idiopathic was used by Schirmer for those spontaneous iritises, the etiology of which is unknown.

** See American Journal of Ophthalmology, 1937, v. 20, 618.

occurred after 650 cataract operations (17 percent), making their appearance for the most part during the winter.

The excellent results achieved with nasal tamponade justify me in regarding serous iritis as of *rhinogenous origin*.

For this reason we should search for the causative agent in the accessory cavities. It is the influenza bacillus that is most often found in the accessory cavities, and due to its peculiarities it is apt to bring about serous iritis, as I showed in 1937.

Besides the Pfeiffer bacillus the *Diplococcus catarrhalis* has recently been brought to my attention.

In a publication from the Budapest First Surgical Clinic there appeared in 1938 a discussion of the bacteriology of the cavity of Highmore. From data derived from 50 cases, Dr. Szende and Dr. Murányi elaborated the findings in 26 chronic and 24 acute cases. In the discharge of the patients with chronic inflammations chiefly streptococci and staphylococci were found, while in the acute cases the discharge contained exclusively pneumococci and catarrhal diplococci in about equal proportions. According to these authors the greater part of their cases were of infections of influenzal origin. As, however, the openings of the antrum and of the ethmoidal sinus are in the same nasal passage, I am justified in presuming that these causative agents may be present in the latter also.

The pneumococcus cannot come into consideration, for, as is well known, this organism is apt to provoke much more serious changes in the eye than are seen in the manifestations of serous iritis. We must therefore turn our attention to the catarrhal diplococcus. This organism can be found on the mucosa of the nasopharynx even in normal conditions and according to the findings of the present writer it alone may be the causative agent

of an inflammation of the cavity of Highmore. Although its pathogenicity is slight, it is nevertheless capable of bringing about a catarrh of the upper respiratory passages. O. Seifert found it in the discharge of patients with a light bronchitis while R. Pfeiffer cultivated it from the deeper respiratory ducts as the causative agent of puerile bronchopneumonias associated with influenza bacillus. Thus the *Diplococcus catarrhalis* may come into consideration as bringing about serous iritis, either alone or associated with the Pfeiffer bacillus.

The question still remains as to how the causative agents reach the eyeball from the sinuses. In my opinion this can take place in two ways; namely, either by the hematogenous route, or by direct passage. The possibility of the former is verified by the known circulatory conditions; as to the latter the pathologic-histological findings offer sufficient evidence.

As I have previously mentioned, in the numerous cases of serous iritis observed by me the rhinological examination established, without exception, the acute catarrhal affection of the mucosa, or its exacerbation.

According to Hajek, when the sinuses succumb to acute catarrh, the mucosa, in its entire thickness, down to the bony wall is affected with an inflammatory edema and swells to three times its normal thickness. Within this, numerous smaller and larger cavities form which become filled with clotted serum, and the mucosa contains polynuclear leucocytes and lymphocytes.

According to this author a high degree of edematous inflammation in the presence of a relatively mild acute inflammation is a specific characteristic of the mucosa of the ethmoidal sinus. As a result, the inflammation extends relatively easily and speedily to the deepest layers of the mucosa, which acts as a periosteum.

In this sense, in the catarrhal affections of the sinuses (in contrast with empyema) no defensive dam of inflammation arises, and the lymphocytic infiltration can extend unchecked to the bony wall. It will not be hindered in its progress here either, for according to the previously mentioned discovery of Herzog, the medullary cavities of the bony wall provide a straight path for the etiologic agents toward the optic canal. Here it is easy for them to get into the pia mater and thence to settle down in the uvea.

It is thus readily believable that one of the chief factors in the cure of serous iritis is the treating of the nose, for when we insure an undisturbed drainage of the pathologic discharge of the sinus, we at the same time put an end also to the reserve of migrating causative agents. The resisting power of the attacked eye, supported by mydriatics, enables it to eliminate the remaining pathologic agents and recovery follows.

Hajek further writes: "That the rapid drainage of the discharge from a cavity is the most important requirement for a prompt recovery, is a universally valid basic rule of pathology."

Iritis serosa is in most cases unilateral, and the affection only infrequently makes its appearance on the other side also. This happens either some weeks later or may ensue after the primary eye has become blind, after a period of years. In the latter case Weigelin observed, subsequent to the removal of the primary eye, considerable improvement in the secondary eye, and the histological examination revealed a fresh inflammatory focus in the uvea, just as is the rule in sympathetic ophthalmia.

Serous iritis occurs more frequently than optic neuritis because the former, unlike optic neuritis, may supervene even in the presence of the thickest bony wall. In spite of this, just as in the case of the

latter, it is of less frequent occurrence than is the inflammation of the accessory cavities. The cause lies in the fact that for the development of serous iritis in addition to a catarrhal sinusitis another factor is also necessary—the condition that may develop in the uvea (in addition to constitutional factors) from an injury, or an unsuccessful operation, or an intra-ocular tumor.

According to the statement of other writers retrobulbar neuritis does not occur in juveniles, and I can allege the same as to serous iritis, for amongst the numerous patients under my observation there was none under 14 years of age. This means that both pathologic forms alike are related to the diseases of the posterior sinuses, which are not developed before the age of puberty. On this basis White's statement that optic neuritis is caused by disease of the antrum is in error, for this cavity has been shown to be present even in infants.

SUMMARY

As can be seen from the foregoing, the pathogenesis of optic neuritis and of serous iritis displays considerable differences; they have, however, many points in common.

The optic neuritis of rhinogenic origin is the outcome of an *aseptic process* going on in the optic canal, and is brought about exclusively by mechanical factors. Its origin is in the empyema of the posterior sinuses, or the chronic hypertrophic inflammation of the latter.

Spontaneous serous iritis, even in the presence of syphilis or tuberculosis, is in every instance the outcome of a *catarrhal infection*.

The source of infection is the catarrhal inflammation of the posterior sinuses, and pathogenic agents migrate directly from the sinus into the canal and thence, by way of the pia mater, into the uvea.

INTRAOCULAR TENSION IN ELECTROPYREXIA*

A PRELIMINARY REPORT

H. C. ERNSTING, M.D.

Cleveland, Ohio

There has been a most marked interest in electropyrexia within the past few years, but published data dealing with the effects of electropyrexia on the intraocular tension have not come to this writer's attention.

It was thought quite possible that an elevation of the intraocular tension might occur in electropyrexia and hence prove a contraindication to the treatment of those eye diseases (such as corneal ulceration, with the possibility of herniation or perforation of the cornea and glaucoma) in which such an event might prove disastrous. This study was therefore undertaken in an attempt to determine the effects of this type of artificially induced fever on the intraocular tension.

Neither the state of refraction nor the age has any appreciable effect on the intraocular tension. Holocaine has no influence on the intraocular pressure, though it does affect the cornea by producing "polygonal dry spots" which quickly disappear.¹ There are, however, many factors that may affect the intraocular tension, some of which are: certain drugs, external influences, action of the sympathetic and trigeminal nerves, action of the muscles, and so on.²

In electropyrexia or hyperpyrexia as induced by the Kettering Cabinet, it was found in the majority of 19 cases studied that the intraocular tension was definitely affected. The patients who were examined were suffering from various types of

arthritis and only two presented ocular pathology of any significance.

The procedure, prior to fever therapy, varied with the case to be treated. During fever therapy a sedative was given shortly after the temperature began to rise. The majority of patients received morphine gr. 0.25; some few received equivalent doses of pantopon or codeine, and an occasional patient received sodium amytal gr. 3. The dose was repeated, if the treatment was long or the patient became restless. The fluid level was maintained by the oral administration of 0.6 percent saline or, on rare occasions, of plain water. The average patient took between 2,000 and 2,500 c.c. of fluid per treatment. The rectal temperature was watched closely. Ice applied to the face and a fan situated near the head contributed somewhat to the patient's comfort. The duration of each treatment varied with the individual case.

Most investigators believe that the effects of artificial fever are unlike those of natural fever, but there are a few³ who report the effects to be quite similar. It is almost universally believed, however, that fever stimulates the development of immune bodies, favors phagocytosis, exerts an unfavorable influence upon the growth of certain bacteria, and diminishes the potency of toxins. Following a fever treatment, it is stated that the white blood cells are constantly increased. The polymorphonuclear leukocytes show a marked increase⁴ and there is a definite shift to the left in the Schilling hemogram. The red blood cells and hemoglobin do not show much change. There is a loss of

*From the service of Drs. P. G. Moore, G. L. Miller, and B. J. Wolpaw, Department of Ophthalmology of the Western Reserve University School of Medicine and the Cleveland City Hospital.

TABLE 1
 INTRAOCULAR TENSION IN ELECTROPYREXIA

Case	Disease	Hours per Treatment	Temperature	Blood Pressure		Intraocular Tension		
				Before	After	Before	During	After
M. S.	Gonorrheal arthritis	8	Fahrenheit 106-107	mm. Hg 138/100	mm. Hg 104/70	mm. Hg 20 18	mm. Hg 20 18	mm. Hg. 17 O.D. 16 O.S.
W. T.	Tabes arthritis	8	105-106	140/100	60/60	20 17	20 17	15 O.D. 14 O.S.
T. H.	Infectious arthritis	5	106-107	110/70	80/0	20 18	20 18	15 O.D. 15 O.S.
T. H.	Infectious arthritis	6	106-107	130/90	120/80	20 18	20 18	17 O.D. 15 O.S.
L. N.	Infectious arthritis	3	104-105	120/68	120/70	18 20	18 20	18 O.D. 20 O.S.
H. D.	Interstitial keratitis	5	105-106	120/74	110/70	18 18	18 18	14 O.D. 20 O.S.
F. D.	Atrophic arthritis	3	103-104	112/60	92/58	20 20	20 20	14 O.D. 14 O.S.
A. A.	Atrophic arthritis	3	103-104	168/70	130/60	23 23	23 23	15 O.D. 15 O.S.
R. T.	Gonorrheal arthritis	8	106-107	136/100	104/60	15 20	15 20	12 O.D. 15 O.S.
M. H.	Infectious arthritis	4	105-106	138/90	110/80	23 23	22 23	20 O.D. 20 O.S.
R. D.	Atrophic arthritis	3	103-104	126/80	114/70	23 23		15 O.D. 15 O.S.
L. F.	Arthritis iritis	4	105-106	142/98	120/74	20 20		18 O.D. 18 O.S.
K. S.	Infectious arthritis	6	106-107	108/78	100/80	24 26		15 O.D. 17 O.S.
F. M.	Gonorrheal arthritis	5	105-106	140/76	130/70	17 18		15 O.D. 16 O.S.
M. P.	Atrophic arthritis	3	103-104	124/78	110/70	20 20		18 O.D. 18 O.S.
E. T.	Spondylitis	3	104-105	118/62	88/58	15 15		13 O.D. 13 O.S.
M. F.	Atrophic arthritis	3	103-104	122/80	120/68	20 20		20 O.D. 20 O.S.
R. S.	Osteomyelitis of hip	4	101-102	120/70	98/60	17 17		15 O.D. 15 O.S.
D. F.	Atrophic arthritis	3	103-104	129/70	92/54	22 16		17 O.D. 15 O.S.

blood and tissue chlorides and of carbonic acid, and in patients who are subjected to prolonged treatment at high temperatures

this loss of acid ions induces some degree of alkalosis.⁵ This alkalosis may be controlled by the oral administration of 0.6-

percent saline solution and the inhalation of oxygen-carbon dioxide. The blood sugar, nonnitrogenous phosphorous, and serum calcium show little if any change. At the onset of treatment the systolic blood pressure may be elevated slightly, but after treatment it is lowered. During the maintenance period the basal metabolic rate is reported⁵ to be increased 5.5 percent for each degree (Fahrenheit) of temperature elevation. A marked increase in the number and size of the visible capillaries and the rate of flow has been reported, and it is said that this may be taken as a practical index of the circulatory changes that occur throughout the entire body during fever treatment.³

One would expect similar changes to occur in the eye, and the eye does present changes that may be attributed to the effects of hyperpyrexia. The conjunctiva becomes injected, and it is a question whether the fundus does not appear slightly more vascular. The intraocular tension, which was determined under holocaine anesthesia and by means of the

Schiötz tonometer, showed little or no change in 10 cases that were examined during treatment, but the tension, which was taken under the same conditions, 30 minutes after treatment showed a definite drop in the majority of the 19 cases examined (table 1).

CONCLUSION

No conclusions may be drawn from a preliminary report of this type. It is known that the intraocular tension generally follows passively the changes in general blood pressure. It is further known that the blood pressure may be definitely influenced by changes in the capillary system. In the majority of the 19 cases that were examined 30 minutes after fever treatment, the intraocular tension was lowered. It is evident that further study and investigation will be necessary.

I wish to express sincere thanks to the Department of Arthritis and Fever Therapy, whose courteous coöperation has permitted this work.

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CAUSES OF BLINDNESS IN INDIANA

D. H. ROW, M.D.* AND C. D. CHADWICK**

Indianapolis, Indiana

The following report, based on the physical ocular examinations of 2,657 applicants for blind pension in the state of Indiana, gives a fair insight into the common causes of blindness in the mid-western part of the United States. The examinations were made by physicians practicing in or near the county in which the applicant resided, and the examiner was either an oculist or an eye, ear, nose, and throat specialist, as required by the Welfare Act of Indiana for 1936.

As a standard qualifying requirement, the central vision of the better eye of the applicant had to be reduced to 20/200 or less. All of the individuals included in this analysis were so handicapped. All applicants were adults. However, not all applicants were eligible for blind pension because of other considerations; usually financial support from other sources.

Through the coöperation of the National Society for the Prevention of Blindness, a standard form of the causes of blindness, prepared by the Committee on Statistics of the Blind, was obtained. Proceeding with this chart, which has a detailed cross-classification of topographical listings—such as, glaucoma, cataract, iritis, and corneal opacity—along its upper border, and etiological factors—such as, ophthalmia neonatorum, syphilis, trachoma, and diabetes—on the side margin, a topographical and an etiological factor was listed on each of the 2,657 individual records. After this was accomplished, it

was a relatively simple matter to enter the totals on the chart.

The analysis of these records is, for obvious reasons, inaccurate; for example, many of the applicants have been blind for years with secondary changes, such as cataract, developing after blindness, obscuring posterior disease. History of the applicant's loss of vision, in many cases, only confused the issue because of the usual lack of knowledge on the part of the applicant as to the real cause of his blindness.

Cases reported on the individual applicant's forms as cataract and glaucoma, were classified as glaucoma, since it seemed reasonable to consider the more profound and serious disease as the actual cause of blindness. Likewise, cases reported as senile cataract, but in which there was no light perception, were classified as posterior disease, without reference to the cataract.

Some applicants had lost one eye from injury or disease years before the loss of the second eye. Unless the question of sympathetic ophthalmia was involved, the loss of the first eye was not considered in compiling these figures on blindness.

Indefinite etiological classifications—such as, "probably syphilis"—were classified as "undetermined by physician," so that the incidence of syphilis in the final totals is probably underestimated.

Sympathetic ophthalmia was classified as uveitis, since the chart used had no listing for sympathetic ophthalmia. This is probably not so serious a deficiency of the record as is, at first consideration, imagined, for the factor of *post hoc propter hoc* comes into prominence when considering this disease, and without

* Consulting Ophthalmologist for Indiana Board of Industrial Aid for the Blind.

** Executive Secretary of Board of Industrial Aid for the Blind of the Indiana Public Welfare Department.

microscopic examination or even clinical observation of the active process of the sympathetic disease the diagnosis is often questionable.

Of all the etiological factors listed, probably the most accurate is trachoma, since the disease and its scar-tissue sequelae are superficial and quite characteristic.

Due to the frequent use of the vague term "senility" as an etiological factor,

this was added to the chart as the only deviation from the printed form of the Committee on Statistics of the Blind.

Because of the large and cumbersome nature of the original cross-classification chart, it has not been included with this report. The following two charts are self-explanatory. Chart 1 gives the numerical frequency of the local eye disease. Chart 2 gives the numerical frequency of the underlying etiology of the eye disease.

CHART 1
TOPOGRAPHICAL INCIDENCE

Cases	Pathology	Cases	Pathology
1. 20% 544	LENS OPACITY (cataract)	8	Infections, specified
363	Senility	7	Toxic poison, not specified
56	Congenital and hereditary, not specified	6	Syphilis, acquired
45	Undetermined by physician	7	Nonindustrial injuries, specified
24	Diabetes	6	Toxic poison, specified
8	Hereditary and familial	5	Nephritis and other kidney diseases
7	Trachoma	5	Systemic diseases, specified
5	Etiology, not specified	4	Firearms
4	Vascular diseases	4	Injuries, not specified
4	Infections, specified	4	Diabetes
3	Nephritis and other kidney diseases	3	Measles
3	Systemic diseases, not specified	3	Typhoid
2	Measles	3	Trauma (including burns)
2	Syphilis, prenatal	2	Syphilis, prenatal
2	Syphilis, not specified	2	Trachoma
2	Tuberculosis	2	Explosives, specified
2	Injuries incidental to surgery	2	Street and traffic accidents
2	Toxic poison, specified	2	Birth injuries
2	Toxic poison, not specified	2	Alcohol (methyl, wood, de-natured, etc.)
1	Ophthalmia neonatorum	2	Systemic diseases, not specified
1	Firearms	2	Etiology, not specified
1	Other explosives, specified	1	Gonorrhea (excluding O.N.)
1	Household activities	1	Scarlet fever
1	Trauma (including burns)	1	Smallpox
1	Injuries, not specified	1	Industrial diseases (including poison)
1	Systemic diseases, specified	1	Tobacco
1	Unknown to science	1	Congenital and hereditary, prenatal
2. 14% 380	OPTIC ATROPHY	1	Noninfectious diseases, central nervous system
173	Etiology undetermined by physician	3. 14% 380	HYPERTENSION (glaucoma)
58	Syphilis, not specified	294	Unknown to science
16	Meningitis	21	Undetermined by physician
14	Neoplasms	16	Vascular disease
12	Congenital and hereditary, not specified	13	Congenital and hereditary, not specified
11	Vascular diseases		
9	Senility		

CHART 1 (continued)

Cases	Pathology	Cases	Pathology
5	Infections, specified	11	specified
3	Toxic poison, specified	9	Infections, not specified
3	Nephritis and other kidney diseases	5	Infections, specified
3	Hereditary and familial	5	Measles
3	Senility	5	Trachoma
2	Infections, not specified	5	Explosives, specified
2	Explosives, specified	5	Trauma (including burns)
2	Toxic poison, not specified	5	Congenital and hereditary, not specified
2	Diabetes	4	Meningitis
1	Measles	4	Scarlet fever
1	Smallpox	4	Nonindustrial injuries, specified
1	Syphilis, not specified	3	Toxic poison, specified
1	Street and traffic accidents	2	Gonorrhea (excluding O.N.)
1	Injuries incidental to surgery	2	Ophthalmia neonatorum gonorrheal
1	Trauma, including burns	2	Smallpox
1	Injuries, not specified	2	Tuberculosis
1	Neoplasms	2	Typhoid
1	Diseases of pregnancy and childbirth	2	Household activities
1	Systemic diseases, specified	2	Injuries incidental to surgery
1	Etiology not specified	1	Ophthalmia neonatorum
4. 13% 346	ULCERATIVE KERATITIS	1	Syphilis, not specified
194	Trachoma	1	Street and traffic accidents
34	Undetermined by physician	1	Toxic poison, not specified
30	Ophthalmia neonatorum, not specified	1	Neoplasms
18	Smallpox	1	Etiology not specified
16	Infections, not specified	6. 3% 77	UVEITIS
10	Trauma, including burns	27	Etiology undetermined by physician
7	Nonindustrial injuries, specified	17	Injuries, not specified
6	O.N., gonorrheal	6	Trauma (including burns)
5	Gonorrhea (excluding O.N.)	4	Nonindustrial injuries, specified
5	Infections, specified	3	Tuberculosis
4	Injuries, not specified	3	Infections, specified
3	Measles	3	Infections, not specified
2	Tuberculosis	2	Syphilis, prenatal
2	Explosives, not specified	1	Meningitis
2	Congenital and hereditary, not specified	1	Smallpox
1	Meningitis	1	Syphilis, acquired
1	Scarlet fever	1	Syphilis, not specified
1	Syphilis, not specified	1	Firearms
1	Explosives, specified	1	Explosives, specified
1	Toxic poison, specified	1	Explosives, not specified
1	Vascular diseases	1	Household activities
1	Systemic diseases, specified	1	Toxic poison, specified
1	Etiology not specified	1	Nephritis and other kidney diseases
5. 5% 135	DISORGANIZED, ATROPHIC, PHTHISIC EYEBALL	1	Etiology not specified
19	Etiology, undetermined by physician	1	Senility
13	Firearms	7. 3% 71	RETINAL DEGENERATION, INCLUDING RETINITIS PIGMENTOSA
12	Injuries, not specified	15	Hereditary and familial
11	Ophthalmia neonatorum, not	15	Congenital and hereditary, not specified

CHART 1 (continued)

Cases	Pathology	Cases	Pathology
14	Etiology undetermined by physician	1	Hereditary and familial
9	Senility	10. 2%	51 KERATITIS, not specified
6	Vascular diseases	20	Etiology undetermined by physician
6	Etiology unknown to science	4	Infections, not specified
1	Meningitis	3	Infections, specified
1	Syphilis, prenatal	2	Scarlet fever
1	Toxic poison, not specified	2	Explosives, specified
1	Diabetes	2	Nonindustrial injuries, specified
1	Nephritis and other kidney diseases	2	Trauma (including burns)
1	Congenital and hereditary consanguinity	2	Toxic poison, specified
8. 2.3%	65 RETINITIS	1	Measles
15	Diabetes	1	Meningitis
13	Nephritis and other kidney diseases	1	Syphilis, not specified
11	Etiology undetermined by physician	1	Trachoma
5	Syphilis, not specified	1	Tuberculosis
4	Vascular diseases	1	Typhoid
4	Congenital and hereditary, not specified	1	Firearms
4	Senility	1	Explosives, not specified
2	Toxic poison, not specified	1	Street and traffic accidents
1	Measles	1	Injuries incidental to surgery
1	Syphilis, prenatal	1	Injuries, not specified
1	Syphilis, acquired	1	Toxic poison, not specified
1	Infections, specified	1	Hereditary and familial
1	Explosives, specified	1	Congenital and hereditary, not specified
1	Systemic diseases, specified	11. 2%	48 MYOPIA
1	Hereditary and familial	15	Etiology unknown to science
9. 2%	61 CHOROIDITIS	13	Congenital and hereditary, not specified
29	Etiology undetermined by physician	11	Etiology undetermined by physician
4	Vascular diseases	4	Hereditary and familial
3	Infections, not specified	1	Measles
2	Measles	1	Syphilis, prenatal
2	Syphilis, not specified	1	Syphilis, not specified
2	Toxic poison, specified	1	Toxic poison, specified
2	Toxic poison, not specified	1	Systemic diseases, not specified
2	Anemia and other blood diseases	12. 2%	46 IRITIS
2	Systemic diseases, not specified	20	Etiology undetermined by physician
2	Congenital and hereditary, not specified	4	Trachoma
2	Senility	4	Infections, specified
1	Scarlet fever	3	Toxic poison, specified
1	Syphilis, prenatal	2	Injuries incidental to surgery
1	Tuberculosis	2	Injuries, not specified
1	Typhoid	2	Toxic poison, not specified
1	Explosives, specified	2	Systemic diseases, specified
1	Explosives, not specified	1	Gonorrhea (excluding O.N.)
1	Injuries	1	Measles
1	Nephritis and other kidney diseases	1	Syphilis, prenatal
		1	Tuberculosis
		1	Infections, not specified
		1	Explosives, specified

CHART 1 (continued)

Cases		Pathology	Cases		Pathology
	1	Congenital and hereditary, not specified		1	Firearms
				1	Play or sport
				1	Street and traffic accidents
13.	2%	42 DISSEMINATED CHORIORETINITIS		1	Injuries incidental to surgery
	12	Etiology undetermined by physician		1	Trauma (including burns)
	4	Syphilis, not specified		1	Toxic poison, not specified
	4	Hereditary and familial		1	Hereditary and familial
	3	Syphilis, prenatal	16.	1.2%	36 LESIONS, not specified
	2	Infections, specified		10	Etiology undetermined by physician
	2	Anemia and other blood diseases		4	Trachoma
	2	Nephritis and other kidney diseases		4	Injuries not specified
	2	Vascular diseases		4	Congenital and hereditary, not specified
	2	Systemic diseases, specified		3	Syphilis, prenatal
	1	Meningitis		2	Senility
	1	Scarlet fever		1	Measles
	1	Tuberculosis		1	Infections, specified
	1	Typhoid		1	Infections, not specified
	1	Infections, not specified		1	Firearms
	1	Injuries, not specified		1	Household activities
	1	Toxic poison, specified		1	Birth injuries
	1	Congenital and hereditary, not specified		1	Nonindustrial injuries, specified
	1	Senility		1	Vascular diseases
				1	Systemic diseases, not specified
14.	1%	40 AMBLYOPIA, undefined	17.	1.2%	35 INTERSTITIAL KERATITIS
	21	Etiology undetermined by physician		16	Syphilis, prenatal
	5	Congenital and hereditary, not specified		6	Etiology undetermined by physician
	2	Ophthalmia neonatorum, not specified		3	Syphilis, not specified
	2	Trachoma		2	Trachoma
	2	Vascular diseases		2	Tuberculosis
	1	Meningitis		2	Infections, not specified
	1	Ophthalmia neonatorum, gonorrheal		1	Typhoid
	1	Syphilis, not specified		1	Scarlet fever
	1	Infections, specified		1	Toxic poison, specified
	1	Infections, not specified		1	Diabetes
	1	Nonindustrial injuries, specified	18.	1%	27 ILL-DEFINED LESIONS, specified
	1	Trauma (including burns)		16	Etiology undetermined by physician
	1	Tobacco		2	Nephritis and other kidney diseases
				1	Syphilis, prenatal
15.	1.2%	37 IRIDOCYCLITIS		1	Infections, specified
	15	Etiology undetermined by physician		1	Infections, not specified
	4	Injuries, not specified		1	Nonindustrial injuries, specified
	2	Infections, not specified		1	Trauma (including burns)
	2	Nonindustrial injuries, specified		1	Injuries, not specified
	2	Systemic diseases, not specified		1	Toxic poison, specified
	2	Etiology not specified		1	Toxic poison, not specified
	1	Meningitis		1	Vascular diseases
	1	Ophthalmia neonatorum, gonorrheal	19.	1%	27 OPTIC NEURITIS
	1	Trachoma		4	Syphilis, not specified
				4	Toxic poison, not specified

CHART 1 (*continued*)

Cases	Pathology	Cases	Pathology
4	Etiology undetermined by physician	3	Injuries, not specified
2	Meningitis	2	Firearms
2	Neoplasms	2	Other explosives, specified
2	Nephritis and other kidney disorders	2	Nonindustrial injuries, specified
2	Vascular diseases	1	Syphilis, prenatal
1	Syphilis, prenatal	1	Explosives, not specified
1	Nonindustrial injuries, specified	1	Neoplasms
1	Injuries, not specified	1	Etiology not specified
1	Alcohol (methyl, wood, denatured, etc.)	24. .6%	16 PANOPHTHALMITIS AND ENDOPTHALMITIS
1	Toxic poison, specified	7	Infections, not specified
1	Systemic diseases, specified	3	Injuries, not specified
1	Etiology not specified	1	Meningitis
20. 1%	22 DISORDERS OF OPTIC NERVE, not specified	1	Syphilis, prenatal
12	Etiology undetermined by physician	1	Trachoma
5	Senility	1	Explosives, not specified
2	Diabetes	1	Toxic poisons, specified
1	Syphilis, acquired	1	Etiology undetermined by physician
1	Injuries, not specified	25. .5%	13 NEURORETINITIS
1	Nephritis and other kidney diseases	3	Syphilis, prenatal
21. 1%	22 RETINAL HEMORRHAGE	3	Etiology undetermined by physician
7	Vascular diseases	2	Congenital and hereditary, not specified
4	Etiology undetermined by physician	1	Infections, specified
3	Nephritis and other kidney disorders	1	Infections, not specified
2	Tuberculosis	1	Toxic poison, not specified
2	Diabetes	1	Vascular diseases
2	Senility	1	Hereditary and familial
1	Syphilis, not specified	26. .3%	10 DISORDERS OF THE EYEBALL, not specified
1	Injuries, not specified	4	Etiology undetermined by physician
22. 1%	21 DETACHED RETINA	1	Ophthalmia neonatorum, not specified
9	Etiology undetermined by physician	1	Infections specified
2	Injuries incidental to surgery	1	Infections not specified
2	Systemic diseases, specified	1	Firearms
2	Etiology unknown to science	1	Industrial injuries, not specified
1	Infections, specified	1	Etiology, not specified
1	Firearms	27. .3%	9 OPACITIES
1	Household activities	2	Infections, specified
1	Trauma (including burns)	1	Trachoma
1	Congenital and hereditary, not specified	1	Explosives, specified
1	Senility	1	Street and traffic accidents
23. .7%	19 DISORDERS OF THE EYEBALL, specified	1	Vascular diseases
6	Etiology undetermined by physician	1	Systemic diseases, not specified
		1	Congenital and hereditary, not specified
		1	Etiology undetermined by physician

CHART 1 (continued)

Cases	Pathology	Cases	Pathology
28. .3%	9 DISLOCATED LENS	1 Hereditary and familial	
	5 Congenital and hereditary, not specified	35. .2%	6 INTRAOCULAR HEMORRHAGE
	2 Etiology undetermined by physician	5 Etiology undetermined by physician	
	1 Injuries, not specified	1 Vascular diseases	
	1 Hereditary and familial	36. .2%	5 CONJUNCTIVITIS
29. .3%	8 DISORDERS OF CHOROID AND RETINA, not specified	3 Etiology undetermined by physician	
	4 Senility	2 Infections, not specified	
	2 Etiology undetermined by physician	37. .1%	4 DEVELOPED AND DEGENERATIVE ANOMALIES, not specified
	1 Syphilis, not specified	2 Congenital and hereditary, not specified	
	1 Etiology not specified	2 Etiology undetermined by physician	
30. .2%	7 DISORDERS OF CHOROID AND RETINA, specified	38. .1%	3 DISORDERS OF OPTIC NERVE, specified
	4 Etiology undetermined by physician	1 Infections, specified	
	1 Neoplasms	1 Hereditary and familial	
	1 Diseases of pregnancy and childbirth	1 Congenital and hereditary, not specified	
	1 Etiology unknown to science	39. .1%	2 DISORDERS OF CONJUNCTIVA, not specified
31. .2%	7 DISORDERS OF IRIS AND CILIARY BODY, specified	1 Trachoma	
	3 Congenital and hereditary, not specified	1 Infections, not specified	
	2 Injuries, not specified	40. .1%	2 ALBINISM
	1 Explosives, specified	1 Congenital and hereditary, not specified	
	1 Systemic diseases, specified	1 Hereditary and familial	
32. .2%	7 DISORDERS OF CONJUNCTIVA, specified	41. .1%	2 REFRACTIVE ERRORS, specified
	2 Etiology, unknown to science	1 Congenital and hereditary, not specified	
	1 Syphilis, prenatal	1 Etiology undetermined by physician	
	1 Trachoma	42. .1%	1 DEVELOPED ANOMALIES AND DEGENERATIVE CHANGES
	1 Trauma (including burns)	1 Syphilis, prenatal	
	1 Systemic diseases, specified	43. .1%	1 ANOPHTHALMOS (excluding surgical)
	1 Etiology not specified	1 Etiology not specified	
33. .2%	6 MICROPTHALMOS	44. .1%	1 OBSTRUCTION OF CENTRAL ARTERY OR VEIN
	6 Congenital and hereditary, not specified	1 Vascular disease	
34. .2%	6 DEVELOPED AND DEGENERATIVE ANOMALIES, specified		
	2 Congenital and hereditary, not specified		
	2 Etiology undetermined by physician		
	1 Septicemia		

CHART 2
ETIOLOGICAL INCIDENCE

569	Etiology undetermined by physician	17	Tuberculosis
406	Senility	16	Systemic diseases, specified
321	Etiology unknown to science	14	Systemic diseases, not specified
226	Trachoma	11	Scarlet fever
160	Congenital and hereditary, not specified	11	Injuries, incidental to surgery
87	Syphilis, not specified	10	Ophthalmia neonatorum, gonorrheal
65	Injuries, not specified	9	Gonorrhea (excluding O.N.)
65	Vascular diseases	9	Syphilis, acquired
59	Infections, not specified	9	Typhoid
53	Infections, specified	7	Explosives, not specified
51	Diabetes	7	Street and traffic accidents
45	Ophthalmia neonatorum, not specified	6	Household activities
43	Hereditary and familial	4	Anemia and other blood diseases
42	Syphilis, prenatal	3	Birth injuries
37	Nephritis and other kidney diseases	3	Alcohol (methyl, wood, denatured, etc.)
33	Trauma (including burns)	2	Tobacco
31	Nonindustrial injuries, specified	2	Diseases of pregnancy and childbirth
30	Meningitis	1	Ophthalmia neonatorum
29	Toxic poison, specified	1	Septicemia
27	Toxic poison, not specified	1	Play or sport
26	Firearms	1	Industrial diseases (including poison)
23	Smallpox	1	Industrial injuries, not specified
21	Measles	1	Noninfectious diseases, central nervous system
21	Explosives, specified	1	Congenital and hereditary, prenatal
20	Neoplasms	1	Consanguinity
19	Etiology not specified		

NOTES, CASES, INSTRUMENTS

IODISM WITH SEVERE OCULAR INVOLVEMENT*

REPORT OF A CASE

H. KRIEGER GOLDBERG, M.D.

Baltimore

The purpose of this report is to record a case of bilateral edema of the lids and conjunctivae, bullous keratitis, and hypopyon secondary to iodine poisoning. Such severe ocular involvement is rarely observed.

M. F., a white woman, aged 68 years, was first seen at the Johns Hopkins Hospital in February, 1905. She complained of stiffness of the hands and feet. For a year she had experienced tingling of the right foot and a pain which radiated to her right hip from the right leg. She had had fleeting pains in her arms. Also, she had noticed that she could not differentiate coins or buttons when placed in her left hand.

Complete examination, supervised by Dr. Osler, showed only astereognosis of the left hand and moderate ataxia of both arms. Attention was drawn to the peculiar personality of the patient by Dr. Osler, but no details were stated. During her stay in the hospital she was given a saturated solution of potassium iodide. The initial dose was 15 min. and this was increased 2 min. every other day. After four weeks the iodide was discontinued because an iodide rash appeared on the extremities and face. Four days after discontinuing the iodides, the symptoms had entirely disappeared.

Following the patient's return to her home she continued to have "rheumatic" attacks and on her own initiative she took

potassium iodide in the same dosage that had been given to her in the hospital. After using the drug for any length of time she invariably developed a skin eruption over the face and extremities. Sometimes the eruption was macular and at other times it was pustular or vesicular. Cessation of the drug always resulted in disappearance of the rash. The patient noted that with each succeeding skin eruption, a shorter period of iodine consumption was necessary to produce the rash. She had not used the iodides for about one year until in February, 1938, she commenced taking 30 min. t.i.d. with increasing doses every other day. After three weeks a vesicular skin eruption appeared over the face, arms (figs. 1 and 2), and legs. However, on this occasion the patient persisted in the use of the iodide. On March 8th her eyes became painful and her vision failed rapidly. She again entered the hospital on March 11th, when her vision was reduced to light perception in both eyes.

OCULAR EXAMINATION

There was such edema and redness of the lids that they could not be opened voluntarily by the patient. The bulbar conjunctiva of the right eye was chemotic. The cornea was grayish and infiltrated. The iris was similarly discolored. The pupil was contracted, irregular, and adherent to the lens. There was a thin layer of exudate over the surface of the iris with loss of all normal luster and markings. There was a small hypopyon in the inferior angle of the anterior chamber. Tension was normal. The left eye presented a more advanced generalized chemosis. The cornea was grayish and hazy in color. Outlines of the pupil could barely be seen. There was a heavy

*From the Wilmer Ophthalmological Institute of the Johns Hopkins Hospital and University, Baltimore, Maryland.

exudate over the anterior surface of the iris and a large hypopyon half filled the anterior chamber. There was a definite loss of epithelium in a small area toward the 3-o'clock position which stained with fluorescein. Tension was normal. There



the center there were five or six small blebs which appeared to be on the posterior surface of the cornea and to arise between Descemet's membrane and the endothelium (fig. 3).

General physical examination was essentially negative except for the ocular and dermatological findings. The result of the neurological examination revealed the same ataxia of the arms and astereognosis of the left hand which had been found on her first admission. Her personality had not changed. She was inordinately proud of the fact that Sir William Osler had prescribed for her. This probably accounted for her continuing the prescriptions in spite of the repeated at-

Figs. 1 and 2 (Goldberg). Cutaneous lesions of face and arms on admission.



was a bare suggestion of red reflex in both eyes.

Vision was light perception with good projection in each eye.

There were a few bullae over the right cornea and several very faintly staining areas where there had probably been other recent bullae. On the left cornea towards

tacks of iodism. She definitely relished reciting the routine of her disability and her method of combating it.

The Wassermann reaction, blood gonococcal fixation test, blood chemistry, and blood cytology were entirely negative. Cultures taken from the bullae of the skin were sterile. The survey of various

systems was negative. Examination for iodine in the urine showed its presence in large quantities.

On March 11th, the day of admission, the patient was given instillations of atropine one percent t.i.d. and iodides were stopped. Immediately the patient made an unusual and rapid improvement. On March 12th the left cornea no longer stained. On March 15th the patient was able to count fingers at two feet with the right eye and the iris pattern was readily distinguished (fig. 4). On March 22d the vision was 20/200 in each eye. Nuclear sclerosis made it unlikely that further visual improvement could follow. The right eye was otherwise normal. The left eye at this time continued to show some folding of Descemet's membrane in the areas where the bullae had been observed. The skin eruption had entirely disappeared and iodine was no longer demonstrable in the urine. The patient continued to progress in an uncomplicated manner and therefore 14 days after admission she was discharged.

COMMENT

Swelling of the lids and conjunctiva is frequently observed after iodides have been prescribed.¹ Such symptoms may appear without an iodide rash appearing.

More severe ocular involvement has been observed. Lewin,² in 1899 and again in 1925, recorded retinal hemorrhages and corneal lesions resembling the bullae seen

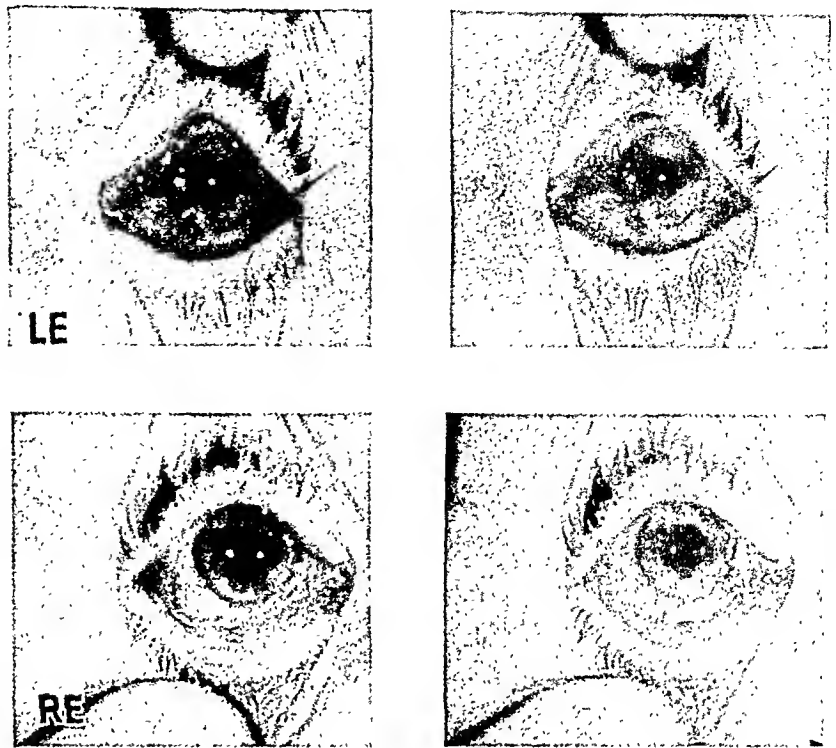


Fig. 3 (Goldberg). Stereoscopic photographs of right and left eyes on admission. Edema of conjunctiva, cornea, and bilateral hypopyon are present.

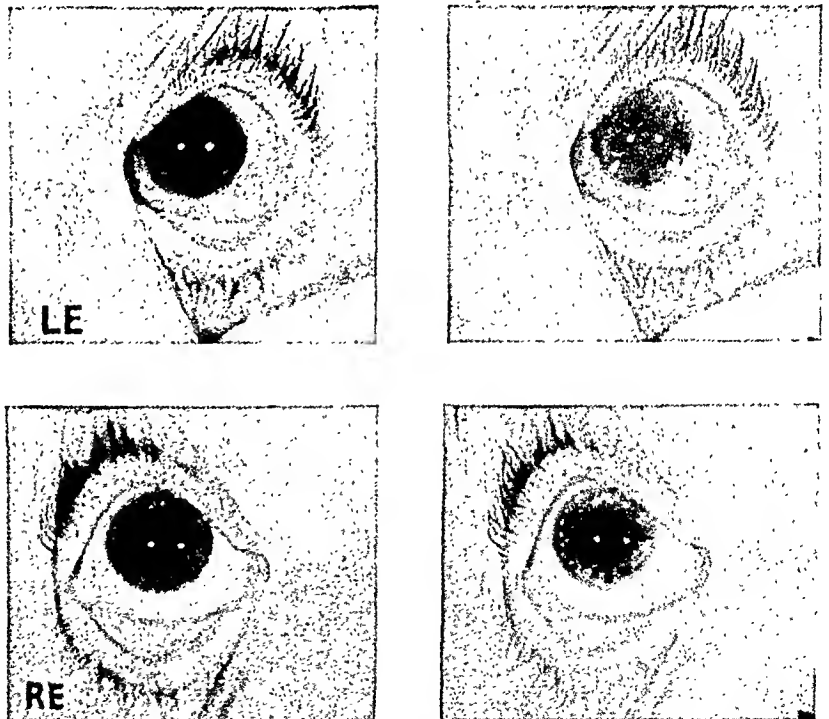


Fig. 4 (Goldberg). Stereoscopic photographs of right and left eyes nine days later.

on the skin as resulting from the use of iodides. Hallopeau² in 1899 described a case in which bullae of the cornea appeared, the cornea became almost entirely opaque and the pupils were fixed to light and were irregular. Discontinuance of the drug was followed by disappearance of the lesions which reappeared when the drug was again prescribed. The case here reported, although similar to that of

Hallopeau, was even more severe. It would seem obvious that the ocular condition observed in the case here reported arose from lesions in the eye which were similar to those frequently observed in the skin. The hypopyon therefore resulted from the irritation of the corneal bullae which caused an irritative iritis and hence a sterile hypopyon.

Wilmer Ophthalmological Institute.

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SOCIETY PROCEEDINGS

Edited by DR. H. ROMMEL HILDRETH

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

SECTION ON OPHTHALMOLOGY

February 11, 1938

DR. WALTER E. CAMP, *president*

REPORT ON THE 15TH INTERNATIONAL CONGRESS OF OPHTHALMOLOGY AT CAIRO, EGYPT

DR. HENRY P. WAGENER, Rochester, Minnesota, said the recent International Congress of Ophthalmology differed from the meetings of most ophthalmological societies in that the major part of the scientific sessions were devoted not to discussions of ophthalmic surgery and therapeutics but to two phases of internal medicine which are closely linked to ophthalmology. The main subjects under discussion were hypertension and endocrinology, with especial reference to their ocular manifestations.

The ophthalmoscopic features and prognostic significance of the retinal lesions seen in cardiovascular renal diseases have been well established. The attention of the Congress was directed rather to the mechanism of development of these retinal changes. While Bailliart and Koyanagi incline still to the assumption of a direct action on the retina of a toxic product, presumably from the kidneys, most of the other speakers seemed to feel that the retinal circulation was involved primarily. It was recognized, however, that the lesions in the retina did not arise as a result of arterial or arteriolar sclerosis but through a dynamic disturbance of blood flow in the realm of pathologic physiology. There is still a lack of definite

proof and agreement as to the exact nature of this disturbance of blood flow. Thus, Volhard adheres strongly to his theory of ischemia; Mylius, of Hamburg, believes that passive hyperemia on the venous side is the predominant lesion, and Fritz, of Brussels, introduces the idea of capillary anisoperfusion and proposes the name "anisospastic retinitis." Koyanagi presented excellent microphotographs of the lesions seen in "albuminuric retinitis," some of which showed marked lesions of the arterioles, which, however, he thinks, are due to invasion of the arteriolar walls by phagocytic pigment-epithelial cells. It is noteworthy, however, that the vascular lesions he demonstrated compare very closely with those found in the arterioles of muscles and of the kidneys.

Lobeck, of Jena, and Thiel, of Frankfurt, reported on a series of measurements of the diameters of the retinal vessels in various types and phases of hypertensive disease. For these measurements, they used a new type of instrument which should be superior to the previous graticule methods and should give us a more accurate idea of what actually happens to the lumen of the vessels in hypertension.

A number of papers were presented on the use and value of measurements of the retinal arterial pressure with the dynamometer of Bailliart. This instrument seems to be more systematically used in Europe than in America and is said to yield significant results in investigations of suspected cerebral lesions and in lesions of the optic nerve and retina, whether associated or not with an elevation of systemic blood pressure. A paper that deserves further study along these lines was presented by Espildora-Luque, of Santi-

ago, Chile, on "Solitary retinal arterial hypertension."

The symposium on endocrinology brought out the fact that there is still much uncertainty as to the influence of specific endocrine insufficiencies on specific eye diseases. The difficulty inherent in endocrine studies was well brought out in the excellent summary of the various endocrine syndromes presented by Snapper, of Amsterdam. Professor Snapper emphasized the close interrelationship between the different endocrine glands and the difficulty of determining at times which of the glands is involved primarily. A paper of considerable interest was presented by Blatt, Bratianu, and their co-workers of Bucharest. They demonstrated roentgenographic changes in the sella in 28 of 37 cases of cataract and evidences of reduced pituitary function in all. Wibaut, of Amsterdam, reported good results from the treatment of retinitis pigmentosa with memformon (theelin).

Two days of the Congress were devoted to sessions of the International Organization against Trachoma and of the International Society against Blindness. The etiology of trachoma came up again for discussion. Thygeson, of New York, reported on his studies of the Halberstaedter-Prowazek elementary bodies which he believes to be the morphologic unit of trachoma virus. Apparently, trachoma is considered now to be most probably a virus rather than a bacterial disease. Busacca, of São Paulo, Brazil, and Cuénod and Nataf, of Tunis, reported the findings of infraorganisms of the rickettsia family in cases of trachoma. The campaign against trachoma and purulent ophthalmia in Egypt is apparently well organized, and very excellent work is being done by the Egyptian ophthalmologists in the treatment of these diseases in spite of the tremendous number of cases which must be handled.

PECULIAR PUPILLARY REACTION TO COLD STIMULATION IN HORNER'S SYNDROME

DR. A. G. ATHENS, Duluth, reported the following case not only because of the unusual nature of its distinguishing symptom but also with the hope that, with careful study in the attempt to correlate the findings with our present knowledge of the underlying anatomy and physiology, it might be the means of throwing a little light on a somewhat confused subject.

A young medical student, aged 20 years, home on vacation, consulted him on December 20, 1937, because he had noticed for four weeks previously that, when he took a drink of cold water, the left pupil would dilate irregularly. On questioning he stated that the same thing occurred but to a less degree when he washed his face or took a bath in cold water. The right pupil was not so affected.

This patient had been treated by him in August and September, 1937, for a superficial marginal corneal ulcer of the left eye. This was treated with local applications, on two occasions, of 5-percent mercurochrome, and atropine, 0.5 percent combined with 1:6,000-mercurybichloride ointment for a period of about three weeks. The pupil was back to normal size at the beginning of school on September 28th. There was no evidence of iritis, and the pupils were equal in size and reacted normally to light and convergence. The media were clear and the fundi negative. One month previous to the onset of the ulcer an abscessed tooth had been removed. Two years previously he had been treated for a similar corneal ulcer by another oculist. He was then under observation for one week. The oculist reports that he saw nothing otherwise abnormal about the eyes. Since that time the eye had been slightly injected at times.

At the age of 13 years, in 1930, he was taken to his family physician because of

obesity. His weight had been increasing abnormally for two or three years previously. He was somewhat listless, apathetic, and dull in school. Examination showed him to be 50 pounds overweight, to have a female distribution of the pubic hair, and underdeveloped genitalia. Basal metabolism was -9 . A diagnosis of Froehlich's syndrome was made and the patient was treated with antuitrin and thyroid extract. After a few weeks there were definite signs of improvement, and the development thereafter appeared to progress along fairly normal lines.

On July 7, 1937, he was admitted to a hospital for study of a lymphadenopathy. It had been noted that various groups of lymph nodes had been enlarging over a period of five months. Examination revealed cervical, axillary, epitrochlear, and inguinal nodes greatly enlarged but not tender. Two nodes from the left cervical group were removed for examination. One of these proved to be caseous. Though a definite diagnosis of tuberculosis could not be made, this was strongly suspected, since the patient had had considerable contact with a maternal grandmother and two aunts who had had this disease. All serological and agglutination tests were negative. X-ray films of the chest were negative. Pulse and respiration were normal throughout his three weeks' stay in the hospital. X-ray therapy was used on the enlarged nodes.

Examination on December 20, 1937, revealed a rather tall, though normally developed, well-nourished young man, apparently a little worried about his condition. He was much interested in the examination and was very cooperative. He was of a rather emotional nature. Several moderately enlarged, fairly discrete, insensitive nodes were found in the neck below the mandibular angles on both sides. A distinct, firm mass measuring 3 by 2 by .5 cm. occupied the region of the left

parotid gland. A similar but much smaller, bean-sized mass was felt in the corresponding position on the right side. These were freely movable under the skin and overlying structures, and were not tender. There was a small surgical scar one inch below the left ear.

The pupil of the right eye in ordinary light measured 4.5 mm. and reacted normally to light stimulus, convergence, and consensually. The upper lid drooped slightly, but the levator functioned normally. There was no enophthalmos. The pupil of the left eye was round and measured 2.5 mm. It contracted promptly and regularly to light and promptly returned to its original size. It also reacted promptly to convergence and consensually. In a semidarkened room it dilated regularly to 7 mm. while its fellow pupil dilated to 8 mm. A 4-percent solution of cocaine dilated the right pupil to 9 mm. and the left to 3.5 mm. Epinephrine hydrochloride 1:1,000 solution dropped into the left conjunctival sac, repeatedly, had no effect on the pupil. One drop of 1-percent homatropine hydrochloride dilated the left pupil and the greatest dilatation was medialward. About six weeks later a small drop of epinephrine injected beneath the conjunctiva of the left eye dilated the pupil quite widely.

When the patient took a swallow of cold water the pupil of the left eye dilated markedly, downward and inward, giving it a distinct pear shape. This followed immediately on taking the water and the pupil promptly returned to its former size and shape—the entire procedure occupying three or four seconds. The reaction resembled an ameboid movement. During the reaction the patient observed a "peculiar sensation" as though the vision dimmed slightly. Washing the face or dipping the hands into cold water produced the peculiar dilatation of the pupil but to a less degree. Warm water either

swallowed or on the hands or face did not affect the size or shape of the pupil. When pressure was made on the left anterior faucial pillar the reaction occurred but not so markedly as with cold water in the mouth. Considerable pressure over the cervical nodes and along the carotid sheath produced no effect on the pupil. Seven weeks after this phenomenon was first noted by the patient it suddenly could no longer be elicited.

The cornea of the left eye showed only a very faint marginal opacity at the site of the former ulcer. The corneal reflex was present. The iris showed no evidence of atrophy and was uniformly colored to match that of the right eye. The other media were clear throughout. The retinal vessels showed no increase in caliber in comparison with those of the right eye. Both fundi were otherwise normal. The tension was normal and no appreciable difference in accommodation between the two eyes could be determined. The visual fields were normal for form and colors. The extraocular muscles were in balance. Visual acuity measured 20/15 in each eye.

This patient presented an atypical picture of Horner's syndrome with the added bizarre pupillary dilatation on peripheral cold stimulation. The signs commonly described as characterizing Horner's syndrome are (1) miosis, (2) narrowing of the fissure from drooping of the upper lid, (3) enophthalmos, (4) unilateral absence of sweating, and (5) hemiatrophy of the face. To these physiologists have added (6) failure of the pupil to dilate with cocaine, (7) dilatation of the pupil with epinephrine in the conjunctival sac. This case differs, then, from the classical Horner's syndrome in the following details. Enophthalmos was not present. As this is by no means a constant or even a common finding in sympathetic paralysis it will not be further considered. Opportunity was not given at the first examina-

tion to study the effects of sweating. The pupil dilated slightly but definitely with cocaine. It did not dilate with epinephrine in the conjunctival sac. Peripheral cold stimulation caused, for a period of six weeks, a dilatation of the lower nasal portion of the pupil.

A fairly careful search of the literature has revealed few similar cases and no such reaction to cold stimulation. Carline observed transitory dilatation of one pupil which remained so for several hours or days. He concluded that the patient was hysterical. Wiesner reported the case of a woman, 60 years old, who had paralysis agitans and also typical Horner's syndrome, and whose pupils were "cat-like and dilated when she took a sharp breath." Erlenmeyer observed bizarre behavior of the pupils of a hysterical woman of 47 years. They continued to change from oval to round, dumb-bell shape, and even assumed ameboidlike movements. Coppez recorded the case of a girl who had mydriasis of one eye which changed to miosis when her head was bent forward. The miosis was accompanied by severe pain. The patient had mediastinal adenitis and Coppez believed that inclining the head caused the enlarged glands to press on the cervical sympathetic producing the pupillary change. Rosenfelt reported a case of carcinoma of the esophagus involving the cervical sympathetic trunk. Typical Horner's syndrome was present, and the pupil dilated markedly when pressure was made over the area. Ehlers reported a case of hippus associated with Horner's syndrome in acute anterior poliomyelitis. Cases of essential iris atrophy, with the pupil assuming, at different times, many shapes have been recorded by Harms, Casey Wood, deSchweinitz, Lane, Zentmayer, and McKeown. In all these cases the lesions were unilateral. While the pupil in this condition dilates irregularly, the ir-

regularity is due to contractures and distortions of the remaining live tissue. These cases, when followed, terminate in glaucoma. Schur studied 34 cases of cervical-sympathetic paralysis and found that psychic stimuli caused dilatation of the pupil on the affected side in all.

Any attempt to explain the atypical features in his case—namely, the behavior with cocaine, epinephrine, and cold stimulus—will naturally involve a review of the anatomy and physiology of the sympathetic control of the pupil. Unfortunately, this is not thoroughly understood and there is controversy on a number of points. Physiologists and neuro-surgeons have found that removal of the superior-cervical ganglion does not always abolish the sympathetics in the eye nor even those to the dilator muscle. They have found it necessary to remove, in addition, the superior-thoracic ganglion from which fibers may follow the vertebral artery, to end, according to Duke-Elder, in the ciliary ganglion, or to remove the ciliary ganglion itself.

DeTakats and Clifford, reporting the results of sympathectomy for retinitis pigmentosa in six patients, stated that in two of these, in which the operation consisted in removal of the superior-cervical ganglion, Horner's syndrome did not develop, and in one case an incomplete Horner's syndrome developed. The test used for complete denervation was failure of cocaine to dilate the contracted pupil. Schur found that cocaine caused a slight dilatation of the pupil in all his 34 cases. This, he thought, was due to relaxation of the sphincter. This view was first expressed by Kuroda in 1915 and differs from that of Duke-Elder, Adler, and others who accept the view that cocaine acts by exciting the sympathetic. Duke-Elder states that although the reaction to cocaine is present immediately after section of the postganglionic fibers

it disappears after degeneration of the nerve.

The slight dilatation to cocaine, then, in his case can probably be accounted for on this basis and is not inconsistent with what can be expected in Horner's syndrome in an early stage. We should expect, however, this reaction to disappear soon.

We may now consider the failure of epinephrine to dilate the pupil in this patient. Epinephrine in 1:1,000 solution when dropped into the conjunctival sac does not dilate the pupil in the normal eye. When epinephrine is injected subconjunctivally or when the epinephrine content of the blood is suddenly increased the normal pupil will dilate. When the superior-cervical ganglion is removed the pupil is still more responsive to epinephrine, even when it is dropped into the conjunctival sac. Physiologists have long known that smooth muscle deprived of its nerve supply becomes hyperirritable to epinephrine. This appears to be a property peculiar to unstriated muscle supplied by sympathetic nerves. In such experiments on the eye the pupil is spoken of as "sensitized"—the "paradoxical pupil" of Langendorff. This sensitization appears to diminish with time although it is not completely abolished even after degeneration of the nerve fibers. Hartman and Loder and Itikawa found the effects of epinephrine upon the denervated pupil to be more striking when their experiments were performed within a few days after removal of the cervical ganglion. One would then expect epinephrine response, as cocaine response, to diminish after the nerve fibers had had time to degenerate. Unfortunately, in reports of clinical cases the time element, in regard to the effect of these stimuli, has been given very little consideration.

Arnold Knapp called attention to the effect of epinephrine on the glaucomatous

eye, where it dilates the pupil even before clinical signs of the disease have appeared. This has been accepted as a valuable diagnostic sign in early glaucoma and probably indicates a hyperirritability of the dilator mechanism.

Hubert recently reported several cases of Horner's syndrome to support his contention that it is necessary, in order to sensitize the pupil, that the lesion involve the superior-cervical ganglion or the post-ganglionic fibers. If the lesion, he contends, is in the cord or the preganglionic fibers the dilator muscle retains its connection with live nerve cells and will not be rendered hyperirritable to epinephrine. He advocates the use of epinephrine to localize lesions involving the sympathetic pathway. Byrne has shown, however, that lesions in the cord or brain stem also render the pupil hyperirritable to epinephrine, excitement, and so forth. Certain systemic diseases such as diabetes and exophthalmic goiter may render the pupil hyperirritable. A weak solution of cocaine previously instilled into the eye appears to sensitize the pupil to epinephrine. This may, at times, account for the erroneous impression that epinephrine dilates the normal pupil.

It is difficult to correlate in this case the reaction to cocaine and the absence of a reaction to epinephrine. It is suggested, as a speculation, that cocaine was more completely absorbed from the conjunctiva than epinephrine and that, had the patient been seen earlier, when the muscle was perhaps more irritable, a reaction to epinephrine would have occurred.

Why did the pupil dilate only on one side? It is possible that, due to a difference in development or a slight atrophy on the temporal side, this portion lost its irritability sooner than that which reacted. Another possible explanation may be found in the peculiar enervation of the dilator muscle. Braunstein showed that

by stimulating the temporal long ciliary nerve, dilatation of the outer upper half of the pupil is produced, and after severing the temporal nerve and stimulating the cervical sympathetic, dilatation of the inner lower half of the pupil occurs. It is possible to believe that the fibers of these two nerves were so separated in the cervical chain or plexuses that those composing the nasal nerve were the ones that escaped, for a time, the destructive lesion. Indeed there is considerable experimental evidence that the pupillodilator and vasomotor fibers run from the ciliospinal center in separate paths.

The patient was reexamined on February 11, 1938. There was a definite hemiatrophy of the left side of the face, and this side remained dry while the right side perspired. There appeared to be a definite enophthalmos even after the drooping lid was lifted. However, none was found with the exophthalmometer, and the appearance of enophthalmos could doubtless be attributed to hemiatrophy of the face. Cocaine no longer dilated the pupil, neither did the pupil dilate spontaneously in the dark. It was therefore reasoned that the reaction of the sensitized pupil to cocaine and in the dark is of a transitory nature.

Discussion. Dr. Henry P. Wagener said studies related to the sympathetic nerve supply to the eye are always of considerable interest. The exact origin of these nerves and their mode of action have not been fully determined as yet. As Dr. Athens has pointed out, a complete Horner's syndrome is not produced in most cases by a simple removal of the cervical-sympathetic ganglia. If the anterior roots of the first and second thoracic ganglia are sectioned also, ptosis, miosis, and failure of the pupil to dilate with cocaine will result in most cases. Enophthalmos is not, however, an early effect of such an operation. If enophthal-

mos occurs at all, it would seem to be the late result of atrophy of the orbital tissues associated with the facial hemiatrophy.

The effect upon the general sympathetic system of local application of cold is also of considerable interest. It has been shown by Hines and Brown that immersion of the hand in ice water for one minute will cause an elevation of blood pressure that is greater in the hypertensive or prehypertensive individual than in the normal person. Hines and Brown thought that a widespread vasopressor reaction occurred through the mechanism of a neurogenic reflex arc. That the reaction was not due to increased secretion of adrenalin was shown by its occurrence in adrenalectomized dogs and in patients with Addison's disease. The reaction occurs also in patients around whose arm a tourniquet is placed to shut off the return flow of blood from the hand in the ice water.

The dilatation of the pupil which occurred in Dr. Athens's patient following the local application of cold at a distant point presents further evidence of a widespread stimulation of the sympathetic nervous system by cold applied to a relatively small area of the periphery. The dilatation of the pupil was not necessarily a response to an increased secretion of adrenalin.

ETIOLOGIC FACTORS IN MYOPIA

DR. T. R. FRITSCHÉ, New Ulm, Minnesota, stated that the causes of axial myopia have been the subject of considerable discussion and many varied and diverse explanations have been given. Various authors have advocated such theories as acquired disease of the posterior segment, uric-acid diathesis, gravity theory, endocrine imbalance, calcium deficiency, epinephrine deficiency, and focal infections as being causes of myopia. Some have denied the influence of heredity, some believe it to be due to lues

or tuberculosis in the parents, some believe that measles plays an important role, some stress the importance of acquired lues, while others believe that it only augments an already existing myopia. The mechanical theory has many advocates, who believe that the oblique muscles and the rectus muscles in their action compress the globe and cause it to bulge posteriorly at the same time that the optic nerve exerts a pull on the posterior globe during convergence. There are those who believe that myopia may be due to a tendency to undue expansion or delay in the toughening process of the sclerotic. Others believe that it may be due to excessive near work or strain, if either eye has had some slight injury. The theory has been advanced that a deficiency of adrenocortical substance may result in an increased formation of aqueous humor which will lead to glaucoma if the eyeball is strong, or to myopia if the sclerotic coat is weak. The observation has been made that it does not occur among the savage races and that it is most prevalent in those who do prolonged close work during the growth period.

Statistics taken by Schleich on 300 infants eyes showed all to be hyperopic. A summary of the examination of 2,400 eyes of small children in Germany showed only nine to have myopia. Stocker in Lucerne examined 4,614 eyes of children between the ages of 7 and 16 years, without cycloplegics, and found 8.4 percent to be myopic. Callan found an incidence of 1.2 percent myopia in Negro children in grade schools and an incidence of 3.4 percent in high schools, out of a total of 457 children who were examined. A statistical study in the United States showed no myopia under 5 years of age, an incidence of 8.1 percent between the ages of 5 and 10, and an incidence of 25.7 percent between the ages of 10 and 20.

Children's eyes are normally hyperopic

and this hyperopia decreases as maturity is reached, due to the growth of the eyeball. It is only natural that there are normal variations in the size of the eyeball, some of which may even be large enough to result in moderate degrees of myopia; yet a myopia of this type should not be considered pathological or due to any of the numerous causes given above. Likewise there are many cases in which the larger size of the eyeball may be purely hereditary and as such the myopia cannot be considered as being due to any of the various causes. Those eyes should be considered as pathologically myopic, in which the myopia appears or progresses at a rate faster than the normal growth rate of the eye.

In the following series of cases the majority had a considerable degree of myopia ranging from 1 to 10 diopters; two cases are included in which there was mixed astigmatism and in which the minus meridian exceeded the plus meridian. During the year 1934 there were 35 cases of congenital lues on record at Ancker Hospital. Several of them were in infants and consequently were not tested. Twenty-eight patients, in age between 3 and 20 years, were refracted under cycloplegia. Sixteen of the 28 (or 57 percent) were found to be myopic, the other 12 (or 43 percent) were found to be normal or hyperopic. Eight of the 35 (or 23 percent) of these patients with congenital lues had interstitial keratitis, and all eight in this particular group had a considerable degree of myopia. In one half of these cases of congenital lues with myopia there were somewhat similar errors of refraction in the two eyes. The others had a considerable difference, both in the degree of myopia as well as a decided difference in the axis of the astigmatism.

It is hard to say what influence treatment of the congenital lues has on the

course or incidence of the myopia. All of the cases at Ancker Hospital were under observation or treatment. There was a record of only one patient, aged 19 years, who had had a refraction test two years before, and his myopia was found to be increased by one-fourth and one-half diopter, respectively, in right and left eyes. Whether there would be a greater incidence of myopia among undiscovered and consequently untreated cases of congenital lues cannot be determined from this series of cases. Likewise it would be interesting to refract these patients again and observe their progress.

Two interesting cases were seen that were not in the Ancker series. These were a sister, aged 29 years, and a brother, aged 24 years. Both father and mother were hyperopic, and both were luetic at the time of the birth of the girl, who developed interstitial keratitis and malignant myopia, with the left eye much worse than the right. The boy, who was born after the parents had been under some treatment, did not develop interstitial keratitis. He has two diopters of simple myopic astigmatism at axis 180 degrees in each eye.

Because of the fact that there was a definitely increased incidence of myopia among congenital luetic patients, it was thought worth while to look for evidences of congenital lues among children and young adults afflicted with myopia. In addition to looking for the usual signs of congenital lues, such as Hutchinson teeth, chronic middle-ear deafness, interstitial keratitis, rhagades, saber shins, and fissures on palms and soles, peculiar formations of the cranium, and a routine Wassermann test, the eyes were inspected with a slitlamp for loss of pigment on the pupillary border, and luetin tests were made. The luetin test is a skin-sensitivity test for the *Spirochaeta pallida* that has

been discarded for many years in favor of the Wassermann and its modifications. The diagnosis of congenital lues in the absence of positive serology, definite clinical signs, or knowledge of active lues in the parents is practically impossible, and on this account it is thought that the luetin reaction might prove to be valuable. After examining 25 myopic patients and finding nothing more than a few having decreased or absent pigment of the pupillary margin and two questionably positive luetin reactions, he became discouraged and discontinued doing all the extra work on the routine refraction cases. These three were aged 29, 37, and 50 years. All three had negative Wassermann reactions and positive luetin tests. The parents of the two older cases were dead and there was nothing in the history to suggest lues. The younger patient had bilateral chronic otitis media. His mother was dead, but his father was living; a Wassermann test was negative, and the father likewise denied any luetic infection. Viewed with the slitlamp all three of these persons had interstitial keratitis typical of that seen in the interstitial keratitis of congenital luetics.

Just how the congenital syphilis acts to produce an increased incidence of myopia is a debatable question. Possibly there may be a low-grade luetic scleritis. At least in the cases of interstitial keratitis, in which one actually sees the disease of the cornea and which often results in the stretching or distortion of the cornea, one could readily imagine that this disease could exist in the sclera as well as in the cornea and result in an enlarged eyeball. Likewise a person afflicted with congenital lues can be assumed to be constitutionally inferior and naturally would be more apt to suffer some endocrine or nutritional disturbances which may act in some way to weaken the

sclerotic coat of the eyeball. In determining the size of a given eyeball, two factors must be considered. In the first place there is a hereditary factor. This factor determines a tendency toward a certain size of eyeball, as well as a tendency toward a certain degree of toughness of the sclerotic coat. The second factor is the intraocular pressure. Both the intraocular pressure as well as the toughness or tensile strength of the sclerotic coat may be altered by numerous conditions. The intraocular pressure may be altered by endocrine, vasomotor disease, physical or mechanical conditions. The toughness of the sclerotic coat may be altered by growth, disease, trauma, endocrine, and nutritional causes. Thus in the final analysis it can be seen that pathological myopia is not due to any one cause, but to a number of conditions working together, and that a condition which is most important in producing one case of myopia may be the least important in another.

George E. McGeary,
Secretary

LOS ANGELES SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

February 28, 1938

DR. CLIFFORD WALKER, *president*

SOME PRACTICAL CONSIDERATIONS IN THE INTERPRETATION OF VISUAL FIELDS

DR. HAROLD F. WHALMAN opened his discussion with the admonition to observe standard conditions when taking visual fields, emphasizing particularly the necessity for adequate and constant illumination. For this he preferred artificial light, which, of course, can easily be controlled. He pointed out the importance of the quantitative method of plotting the perimetric fields and indicated that his prefer-

ence for this purpose was the tangent screen and a series of test objects ranging from 1 mm. to 40 mm. in size. The patient should sit at a distance of two meters from the point of fixation.

Dr. Whalman then presented various characteristic field defects. He pointed out the difference between the neurasthenic and the hysteric fields. In neurasthenia the field is a spiral, starting out at approximately normal limits in the periphery and gradually decreasing in extent as each meridian is tested until the field has come in close to the point of fixation. In hysteria the concentrically contracted field for one test object shows no increase in extent when larger test objects are used.

In retrobulbar neuritis green may be lost entirely while the field for red is reduced considerably. The papillomacular bundle is frequently involved, giving a central or paracentral scotoma. Toxic amblyopia may be considered a chronic variety of retrobulbar neuritis with the involvement beginning in the ganglionic retinal cells and then spreading to the nerve fibers of the papillomacular bundle. This again produces paracentral scotoma. Bizarre fields are produced by chorio-retinitis. In primary optic atrophy there is an early and rapid loss of the red and green fields as well as the nasal form fields.

Dr. Whalman then outlined the possibilities of field changes in hypophyseal tumor, stating first that in some of these cases there is an early occurrence of paracentral scotoma due to a toxic effect on the papillomacular bundle. Later the effects of pressure or stretching of the chiasmal crossed fibers can be detected by the appearance of quadrant anopsia and hemianopsia. A field which starts as a bitemporal defect might later be changed into a homonymous defect by the bursting through of a pituitary stroma to one side of its confines, producing pressure on only

one optic tract. It is possible also for unilateral blindness to occur with a normal or partially changed field on the other side.

Discussion. Dr. Clifford Walker stated that 50 percent of pituitary tumors produce homonymous field defects rather than bitemporal, so that the latter cannot be considered typical of pituitary lesions without cognizance of the former.

A TREATMENT FOR CHRONIC DACRYOCYSTITIS

DR. PAUL SOUTHGATE read a paper on this subject which was published in this Journal (October, 1938).

Harold F. Whalman,
Editor.

COLLEGE OF PHYSICIANS OF PHILADELPHIA

SECTION ON OPHTHALMOLOGY

February, 1938

DR. ALEXANDER G. FEWELL, *chairman*

THE ASSOCIATION OF AN ANNULAR PIGMENT BAND ON THE POSTERIOR CAPSULE OF THE LENS WITH A KRUKENBURG SPINDLE

DR. WILLIAM ZENTMAYER reported the case of a boy aged 16 years, who showed in each eye a characteristic Krukenberg spindle. On the surface of the posterior capsule of the lens of each eye there was an annular band of brown pigment. As seen with a +20 D. lens of the ophthalmoscope it had an average width of .5 mm. and was situated about 2 mm. in from the equator of the lens. The margins of the band were more or less serrated. In the right eye the circular band was broken at points corresponding to the 8- and 4-o'clock positions, the gaps being about 2 mm. wide. At these breaks short tags of pigment were seen directed toward the tips of the ciliary processes.

In the left eye the band was unbroken, but there were a few pigment lines running toward the equator of the lens. The refraction was a compound myopic astigmatism.

Cases from literature were cited in which Krukenberg spindles were seen to develop in eyes that were without inflammatory changes.

The anomaly on the posterior capsule of the lens is explained by Mann as being due to the maintenance of the contact between the tips of the ciliary processes and the lens for too long a period. The ciliary ring increases in diameter more rapidly than does the lens, with the result that the ciliary processes are withdrawn from the lens and a space is left between the two.

In view of the cases of Krukenberg spindle cited and the opinion expressed by several other writers as to the pathogenesis of this lesion, the author concludes that in the case reported it seems reasonable to believe that granules freed from the pigment line on the posterior capsule of the lens were carried by the circulation of the fluids of the eye into the anterior chamber, where the thermal currents deposited them on the posterior surface of the cornea.

Discussion. Dr. Alfred Cowan said that Krukenberg spindle is of much more frequency than it was considered to be before the advent of the corneal microscope. Very often the same type of pigmentation that is found in Krukenberg spindle can be seen with the slitlamp, but it would escape notice by the ordinary methods of examination with oblique illumination. The pigment is deposited all over the posterior surface of the cornea and the spindle formation is the result, merely, of a denser arrangement over the spindle-shaped area. While it may be that the pigment-ring imprint on the posterior surface of the lens is congenital in most in-

stances, he has seen this condition as the result of inflammation several times.

DELAYED REMOVAL OF MAGNETIC FOREIGN BODIES FROM THE VITREOUS

DR. CHARLES R. HEED detailed the history of three patients and emphasized the importance of accurate localization and early extraction of magnetic foreign bodies, before the advent of degenerative changes which, he believes, result in an overwhelming percentage of all cases where an ultraconservative policy has been pursued. He advocates a scleral incision when the metal is located behind the lens, and counsels against the introduction of any magnet tips into the vitreous.

Case D. B. was examined five days after the accident. Vision O.D. was 20/100. There was an incomplete coloboma at the 11-o'clock position, due to an operation by the company physician to remove particles of torn iris, on the day following the accident. A small wound of the cornea, iris, and lens periphery was found with a posterior star opacity. A magnet extraction was made through the scleral incision on March 11, 1937. Two months later the vision was 20/20, and the eye was quiet. Ophthalmoscopic and slitlamp examinations exhibited a less dense opacity of the posterior subcapsular star.

Case B. R. was examined June 23, 1937, 112 days after the accident. The pupil was dilated; the iris was copper colored, and pigment cells were seen on the anterior nasal quadrant posterior to equator. Diagnosis: retinochoroiditis with symptoms of siderosis. After localization, a metallic body, 1.5 mm. in size, was extracted by means of a magnet through the scleral incision. At the last visit, July 20, 1937, vision was 20/30. No deposits on the capsule were seen, and only a few vitreous opacities.

Case T. J. A. was examined six days after the injury. The patient was myopic, with corrected vision of O.D. 20/20, O.S. 20/200. A particle of metal from an iron pin or hammer had entered the left eye through the upper lid. The X ray located the metal in the vitreous. Vision became blurred in 48 hours and there was severe pain three days later. A delicate haze in the vitreous and a somewhat blurred disc were seen, but there was no apparent retinochoroidal lesion nor hemorrhage. The slitlamp showed marked wrinkling and folds of Descemet's membrane, many cells in the aqueous, no apparent change in the lens, and an increase of cells in the vitreous. Diagnosis: iridocyclitis. Localization demonstrated a metallic foreign body, spherical, 2 mm. in diameter, in close proximity to the ora serrata, 4 mm. to the nasal side of the median line. A magnet extraction through the scleral incision, on the nasal side of the superior rectus, about 8 mm. posterior to the limbus, was made. There was no prolapse of vitreous or pigment. Severe pain was experienced for two hours. The patient slept well and was free from pain on the following morning. He was discharged on November 8, 1937; when examination showed vision in the left eye, corrected, to be 20/50. By means of the slitlamp, a few fine vitreous opacities were observed, but no hemorrhage nor visible retinochoroidal lesions. Descemet's membrane was clear and free from wrinkles, the capsule and lens were clear, and there were no cells in the aqueous. A report from his physician made two months later, gave vision, corrected, as 20/20.

Discussion. Dr. H. Maxwell Langdon reported on a patient, whom he had seen about twelve years ago. She had been to one of the large hospital clinics after having had a needle strike the eye from a machine on which she had been sewing. She herself suggested an X-ray examination,

but was told there was no foreign body in her eye. Not satisfied with this, she went to a private physician, who also assured her that an X-ray examination was unnecessary. By this time, her employer had notified the insurance company. The X ray showed a part of the needle, over one-half inch long. It had been in the eye almost a week when he saw her. Fortunately, a magnet attracted the end of the needle and it came out through the posterior scleral wound readily. The result was an eye with a vision of 5/9.

Another case which had always interested him was that of an employee of the Pennsylvania Railroad in its shops at Olean, New York. This man felt something strike his eye while at work and very promptly an X-ray film was taken, which was said to be negative. The eye was free from inflammation, the vision was normal, and he was told that there was no foreign body in his eye. In a short time he returned saying that he had no pain and could see; but he was sure there was something in his eye and the same procedure was gone through again with negative findings. He returned again after an interval of time but was sent to Philadelphia. Dr. Newcomet localized a very small foreign body, not as large as the head of a pin, which was easily removed with a magnet, and the patient returned to work, there never having been any inflammation of the eye and the vision never having been less than 6/6.

Unless the foreign body is in the anterior chamber, Dr. Langdon favors removal by the posterior route.

Dr. Leighton F. Appleman agreed with Dr. Heed that foreign bodies should be removed as soon as possible after their presence within the eye has been established. It is not always possible to see a foreign body within the eye, due to hemorrhage; therefore X-ray examination should always be made. The amount

of intraocular disturbance may vary considerably, depending upon the position of the wound of entrance and the size and shape of the penetrating particle. Also the subsequent reaction will depend upon whether infection has been introduced with the foreign body. Clean, magnetic bodies can often be removed through the wound of entrance; if this is not possible, an incision through the sclera may allow of its passage after the tip of the magnet is presented at the opening.

Dr. Walter I. Lillie said that he had removed an intraocular foreign body situated in the vitreous of the right eye of a young man. It had entered the vitreous through the lower nasal sclera, just posterior to the ciliary body. His convalescence was uneventful, and the eye is now normal, except for a small area of healed choroiditis at the site of entrance and exit of the foreign body. His vision of 3/60 can be improved only to 6/60 with a +.50 D. sph. \approx +1.00 D. cyl. ax. 90°. The visual-field examination was quite interesting, inasmuch as he would only see the 10-mm. test object in the extreme opposite field from any avenue of approach. This, of course, does not conform with any type of organic field change, or that associated with amblyopia ex anopsia, or hysteria. Dr. Lillie is sure that the patient is malingering, and such a situation should always be thought of in a compensation case.

THE LATE RESULTS FROM CERVICAL SYMPATHETIC RESECTION IN RETINITIS PIGMENTOSA

Dr. E. B. SPAETH reviewed the results of seven cases and said that while no definite statement can or could be made, there are some indications present which seem to suggest that this form of therapy may be seriously considered in certain cases.

Discussion. Dr. William Zentmayer

said that if the pathology of pigmentary degeneration of the retina is what we believe it to be and the disease is an abiotrophy, he would not expect more than a transient improvement in the vision from a sympathectomy.

WARREN S. REESE,
Clerk.

SAINT LOUIS OPHTHALMIC SOCIETY

February 25, 1938

Dr. ROY MASON, *president*

METASTATIC ACTINOMYCOTIC CHOROIDITIS

Dr. JULE ELZ read a paper on this subject which will be published in this Journal.

Discussion. Dr. Harvey D. Lamb said that Dr. Elz is very fortunate in getting such an unusual specimen. For that matter, any eye with a metastatic or endogenous inflammation, that can be examined anatomically in the florid stage, is valuable. Dr. Elz's case with this organism is the only one of its kind ever to have been reported. Axenfeld in 1894 stated that in cases of metastatic septic endophthalmitis, if the involvement was bilateral, the primary change was usually in the retina. If only one eye was affected, the choroid, as a rule, was the first coat of the eye to be inflamed. Axenfeld, however, could give no explanation why in one individual the retina and in another the choroid should be the primary seat of the septic process in the eye. The septic emboli in the retina are very readily discharged from the retinal blood vessels into the vitreous. From the vitreous, the irritant coming in contact with the ciliary body and retina causes the formation of pus cells from these coats. As a consequence, the vitreous receives many pus cells and the eye is hopelessly lost. Dr. Elz demonstrated that in his case there was a primary deposit of the organism

in the choroid. He early noted clinically a complete detachment of the retina. The pus cells are all subretinal because they come from the infected choroid. In addition the choroid is generally densely infiltrated with pus cells. A panophthalmitis can occur from septic involvement of the retina or from a septic choroiditis.

INDIRECT CHOROIDAL TEARS

DR. LESLIE C. DREWES read a paper on this subject which will be published in this Journal.

Discussion. Dr. Harvey D. Lamb said that Dr. Drewes has shown how important it is, in a rupture of the choroid, to take a field of vision. Certainly, in one case that he saw very early, with hemorrhages that covered the retinal blood vessels, there must have occurred a tearing of the retinal tissues. It is novel to have a rupture of the choroid, without a tearing of the lamina vitrea, as Hagedoorn found anatomically. If there exists a simple separation of the pigmented epithelium of the retina, it is no choroidal rupture. The main trouble is that we do not have enough anatomical examinations of eyes with so-called choroidal ruptures.

Dr. B. Y. Alvis said the point was made that the yellow-pink portion of this tear resembled the lesion of the retina. That being the case it would seem that it should have destroyed the maculopapular bundle and have cut down the central vision very materially. The central part of the field should have been lost. It is more likely to be a lesion of the superficial portion of the choroid; whereas the white portion involves the entire choroid and the retina.

Dr. Drewes said the fact that this optic-nerve atrophy was noticeable in a week after the injury indicates the damage of the nerve fibers. Quite a number of such cases have been reported in the literature and about 20 cases of incomplete nasal scleral tear.

NONOPERATIVE IMPROVEMENT OF DIVERGENT STRABISMUS

DR. VINCENT L. JONES stated that an improvement in exotropia without operation is not unusual. The two cases here presented, being of 40 and 50 degrees divergence, are considered sufficiently unusual to warrant reporting them.

The first, a boy, 19 years of age, had a 40-degree divergence. Vision in the right eye was 20/24 and with -0.75 D. cyl. ax. 180° equalled 20/16. Vision in the left eye was 20/32, and with -0.50 D. cyl. ax. 180° equalled 20/16. A recession of the external rectus of the right eye was performed in October, 1936, and orthoptic exercises were instituted shortly thereafter.

In February, 1937, the patient's eyes were straight when fixating near objects, but the right eye diverged slightly when fixating distant objects. A second operation was advised, which the patient refused. However, orthoptic exercises were continued until the present, and now he is wearing comfortably a moderate over-correction for the compound nearsighted astigmatism. His eyes are straight when fixating distant and near objects, no suppression of either eye is observed, and the fusion is good.

The second case is that of a 35-year-old woman who had an alternating divergent squint for years. When first examined the divergence was 50 degrees, and there was no fusion. Vision in each eye was 20/30, and with -0.50 D. sphere equalled 20/20. Operation was advised but she refused, so an effort to determine if any improvement could be accomplished by exercises was made and continued to date with more or less regularity. Her eyes are now straight, and her fusion is good; she can read comfortably with four prism diopters, base out, before each eye.

These two cases, and particularly the second one, demonstrate very clearly

what a surprising improvement can be obtained in many cases by rather simple orthoptic exercises.

Discussion. Dr. M. L. Greene said he was interested in these cases because he very often saw such conditions when examining patients for the service. There was one case of a young man who had a definite tendency to divergence at times. He could not be measured for adduction, for as soon as prisms were in place, the eyes would diverge. He was overcorrected and in three or four months took another examination and passed the eye test.

Dr. B. Y. Alvis said that following Dr. Greene's suggestion in a paper presented

here some time ago, he tried overcorrection on a child 12 or 13 years old who had a divergence with a tendency to diplopia and who was not able to do at all well in school. The overcorrection was about 1.50 diopters with a good result, and the patient developed a very satisfactory degree of stereopsis. The thing that is puzzling in these periodic divergent cases is that a person may have a perfectly good stereopsis and still at times get an external deviation without diplopia, while at other times the eyes will be parallel and show good muscle function.

H. Rommel Hildreth,
Editor.

AMERICAN JOURNAL OF OPHTHALMOLOGY

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Published Monthly by the Ophthalmic Publishing Company

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Author's proofs should be corrected and returned within forty-eight hours to the *Manuscript Editor*. Twenty-five reprints of each article will be supplied to the author without charge. Additional reprints may be obtained from the printer, the George Banta Publishing Company, 450-458 Alnaip Street, Menasha, Wisconsin, if ordered at the time proofs are returned. But reprints to contain colored plates must be ordered when the article is accepted.

The New Year witnesses the Journal's embarkation on its twenty-second year. Due to the loyal support of the profession it is now possible to publish a bigger and better journal than ever before. The increase of paid subscriptions by more than 200 in the past two years has permitted the continuance of the larger issues introduced in January, 1937. If one may judge from the material now on hand awaiting publication the coming volume promises to be one of the best. The editors take this opportunity to thank the many contributors of original articles, and the abstractors who have devoted so much time for the benefit of others to reading, in many cases translating, and digesting the literature, to present it in condensed form for our readers. It is frequently hard work and always time consuming. To them go the most sincere thanks of the

editor and for them he wishes an especially happy New Year.

This year as heretofore an effort will be continued to present material of practical value to the ophthalmologist so that in each issue there will be much that the clinician can use in his daily work.

Letters were sent out in December to nonsubscribers, suggesting that the Journal would make a welcome gift to a friend or an ideal present for a family to give the ophthalmologist husband or father. This is a thought that we would like to convey to our subscribers, too. If you can help enlarge the subscription list you will do a service to the entire profession as well as to yourself, for new subscriptions permit the publication of a better magazine.

The past year, which marked the initiation of the third decade of the publica-

tion of the combined ophthalmic journals now known as the American Journal of Ophthalmology, furnished an occasion for a very enjoyable luncheon of the editors, collaborators, and stockholders, at the meeting of the American Medical Association in San Francisco. A similar subscriber's luncheon in Saint Louis this spring is being planned. It is hoped that there will be a large attendance.

Nineteen thirty-eight may not have been the best of years for business and profession, and we may not like the socialistic trend in medicine, but as we look the world over we can find a great deal for which to be grateful. So here's for a prosperous and happy New Year.

Lawrence T. Post.

SCIENCE AGAINST DICTATORSHIP

Scientific discoveries of facts or general laws are made by independent thinkers who test new ideas by their knowledge and experience and then submit them to the judgment of others best qualified to appreciate them. The progress of the world has depended on the free thought of great men. Shall it now be stopped to increase or sustain the power of dictators? Science, the growing knowledge of truth, now meets the challenge of dictatorship. Helpful guidance may be needed by children, but a time comes when each must choose, direct, and live his own life. Military power and political authority must not limit nor dictate to science.

Science has now gained a position in human service and direction equal to the influence formally exerted by custom, tradition, or statute law. Scientific truth is more powerful than any ruler. From the days of Vesalius and Harvey medical science has advanced more than under 1500 years of the dictatorship of Galen. The advance of science comes by the great

thoughts of free men. Such thinkers break down the traditions of the past and are foes of tyranny. Dictators cannot tolerate them.

Ophthalmology has contributed to, and shared in, the advances of modern science. Can it continue to do so under dictatorship that burns all books written by Jews and exiles all whose thinking it cannot control? If Hitler had then ruled Germany would Helmholtz, a direct descendant of the pacifist William Penn, have been appointed to teach physiology in the Naval Medical School at Kiel and been permitted to invent the ophthalmoscope? If communists had continued to control Paris, would the devout Catholic, Louis Pasteur, have been allowed to save the silk industry of France, exterminate anthrax, and prevent rabies?

Freedom of independent thought, and to teach what is proved, are more important to scientists than grants of money for research, or laboratories, or professorships, or titles of nobility. Germany and Italy have shared in the development of modern ophthalmology. But they cannot continue to do so when they refuse to hear teachers utter new scientific truths. Already the literature that comes in German or Italian journals is less important than it was before teaching positions were placed under Nazi and Fascist control. France, Britain, and America now take the leadership in scientific investigation and study of ophthalmology. Holland, Belgium, Switzerland, Scandinavia, Finland, and, perhaps, the Soviet Union, must be looked to for really important contributions to future ophthalmic literature.

Edward Jackson.

AMERICAN BOARD OF OPHTHALMOLOGY CHANGE IN METHOD OF EXAMINATION

With steady increase in the number of

candidates presenting themselves for examination, one of the most important problems in the work of the American Board of Ophthalmology is as to the type of examination which will most satisfactorily determine whether or not the candidate is entitled to the Board's certificate.

The Board has kept before it consistently the principle that its investigation of professional qualifications must seek to discover whether the candidate may safely be entrusted with the care of important ocular disorders, including errors of refraction and those serious conditions which call for surgical intervention.

In the earlier years of the Board, it was found practicable to divide the examination into two parts, both occurring on the same day. The first part was an oral examination which was completed by lunchtime. The second part was a written examination, held in the afternoon.

With much larger numbers of candidates to deal with, the Board decided a few years ago to omit the written examination, and to depend (so far as examination was concerned) entirely upon oral tests. While much has been said in criticism of any form of examination as a criterion of educational qualifications and ability, examinations do furnish information which it is difficult to obtain by any other means. Certain defects are inherent in oral examinations, other defects may be attributed to a written examination. To some extent each form of examination is complementary to the other.

After careful deliberation, the Board has now decided to use a new plan for examination of candidates. A practical and oral examination will be held, as before, at the time of meeting of the American Academy of Ophthalmology and Otolaryngology and of the American Medical Association, and also occasionally in relation to other important medical assemblies.

Sixty days prior to the date of the practical and oral examination, written examinations will be held simultaneously in various cities throughout the United States. The subjects covered in the written examination will include all the subjects previously covered by the Board's oral examination. It is intended that the first written examination shall be held on Wednesday, March 15, 1939, and candidates will of course receive due notice as to the places of examination.

Each candidate must take the written examination and must pass it satisfactorily before he may appear for the practical and oral examination. (He must also have presented acceptable case reports before appearing for the final examination.)

The oral examination to be held in Saint Louis on May 15, 1939 (at the time of the meeting of the American Medical Association in that city), will deal only with the following six practical subjects: External diseases, Ophthalmoscopy, Pathology, Refraction, Motility, and Practical surgery.

The Board announces that all applications for the written examination which is to be held on March fifteenth must be on file at the Board's office, 6830 Waterman Avenue, Saint Louis, not later than February 15, 1939. All correspondence on the subject must be addressed to that office.

Candidates whose applications are already in the hands of the Board will receive direct notification in regard to the new arrangements.

W. H. Crisp.

BOOK NOTICES

THE PRINCIPLES AND PRACTICE OF PERIMETRY. By Luther C. Peter, M.D. Fourth edition, cloth-bound, 332 pages, 222 engravings, and 5 colored plates. Philadelphia, Lea & Febiger, 1938. Price \$4.50.

This fourth edition of probably the best known book on perimetry by an American author is rather similar to the preceding editions. It is therefore apparently published because of the exhaustion of previous editions rather than for the presentation of new material in perimetry that has been brought out in the last few years. However, even small additions are valuable, as it is always of advantage to keep textbooks strictly up to date.

The subject of perimetry is obviously of very great importance. It is surprising how few of the candidates for the American Board of Ophthalmology are well prepared in this subject, although undoubtedly they do better now than formerly.

For some reason they have seemed to think that this subject is very simple and that a vague idea of general principles is all that is necessary.

Peter's book presents the subject logically and clearly. It is very readable and covers the field adequately. The first chapters are devoted to anatomy, physiology, and technique; the central division to general pathology of the visual field; and the latter part to the special pathology of the fields and various functional nervous diseases. The illustrations are good, being clear and easily understandable. It is a valuable book for the student of eye diseases and for the practicing ophthalmologist.

Lawrence T. Post.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

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| 1. General methods of diagnosis | 10. Retina and vitreous |
| 2. Therapeutics and operations | 11. Optic nerve and toxic amblyopias |
| 3. Physiologic optics, refraction, and color vision. | 12. Visual tracts and centers |
| 4. Ocular movements | 13. Eyeball and orbit |
| 5. Conjunctiva | 14. Eyelids and lacrimal apparatus |
| 6. Cornea and sclera | 15. Tumors |
| 7. Uveal tract, sympathetic disease, and aqueous humor | 16. Injuries |
| 8. Glaucoma and ocular tension | 17. Systemic diseases and parasites |
| 9. Crystalline lens | 18. Hygiene, sociology, education, and history |
| | 19. Anatomy, embryology, and comparative ophthalmology |

7

UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Gallino, Juan. Rubeosis iridica. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 1, pp. 311-313.

The author reports a case of rubeosis of the iris in one eye of a diabetic patient 65 years of age. Some cases reported in the literature are mentioned. The author believes the condition to be produced by proliferation of blood vessels in the course of a torpid iritis.

Ramon Castroviejo.

Meyer, G. P. Uveal tuberculosis. *Jour. Med. Soc. New Jersey*, 1938, v. 35, March, p. 138.

Meyer discusses the diagnosis and treatment of uveal tuberculosis and states that specific desensitization is the most important curative measure.

Theodore M. Shapira.

Miklos, Andor. The late prognosis of operated cases of iridocyclitis. *Graefe's Arch.*, 1938, v. 139, pt. 2, pp. 403-412.

Of twenty eyes with chronic iridocyclitis, repeated paracentesis or therapeutic iridectomy failed to improve and

even made conditions worse in thirteen eyes. Six of the eyes with favorable results had an iridocyclitis of rheumatic origin. Among six eyes with chronic iridocyclitis, cataract extraction was performed in five eyes, with failure by the extracapsular method and success intracapsularly in only one eye, in which the cyclitis had been stationary for years. Beside these cases, the author's material included forty eyes on which similar operations had been performed with analogous results. Iridectomy should therefore be performed in tuberculous iridocyclitis only when a secondary glaucoma cannot be relieved by conservative measures.

H. D. Lamb.

Mohamed, I. A. Studies of a series of cases of sympathetic ophthalmia. *Bull. Ophth., Soc. Egypt*, 1936, v. 29, p. 168.

A study of 27 cases of sympathetic ophthalmia is presented. Eight of the cases followed perforating or rupturing injuries, and ten occurred postoperatively, nine following iridectomy and one after cataract extraction. Nine cases were not related to trauma. The minimum time of development was eight

days and the maximum time four years. The histopathologic findings are summarized. Edna M. Reynolds.

Scardaccione, Mario. Urotropin in the therapy of sympathetic ophthalmia. *Boll. d'Ocul.*, 1938, v. 17, Feb., pp. 112-123.

Ten cases are reported. Six occurred after penetrating wounds of the eyeball and four after cataract operations. The age of the patients varied from 5 to 73 years, and the onset of sympathetic symptoms from twenty days to three months after the accident or operation. Urotropin was given by daily intravenous injection of 10 c.c. of a 40-percent solution. Better effects were obtained the sooner the treatment was started. In advanced and grave cases the effect was nil even in cases in which urotropin was used with other therapy. In four favorable cases the vision obtained was from 5/10 to 10/10, while in other cases the symptoms subsided with preservation of the sympathizing eye. (Bibliography.) Melchior Lombardo.

Van Lint. Sympathetic ophthalmia evolving during fourteen years. *Bull. Soc. Belge d'Opht.*, 1938, no. 76, p. 25.

The left eye was injured in 1924 and was enucleated thirteen days later, at which time the right eye had begun to show signs of cyclitis. This yielded to treatment but recurred in 1927, 1934, and again in 1936. Vision was reduced to one-third and treatment failed to improve it. One member in discussing the paper expressed the belief that the case might be one of tuberculous iridocyclitis lighted up by trauma.

J. B. Thomas.

Weekers, L., and Reginster, H. Contribution to the study of recurrent hypopyon iritis. *Bull. Soc. Belge d'Opht.*, 1938, no. 76, p. 31.

Dermatologists have recently called attention to a relapsing syndrome peculiar to women and characterized by thrush, acute ulceration of the vulva, and iritis. In some cases reported in men ulcers of the scrotum occurred in association with thrush and iritis. The authors report at length the case histories of two patients, one male and one female. The etiology is uncertain, but the evidence seems to indicate an infectious, allergic lesion. Blood transfusion has proved especially useful. It is noted that the ocular lesions include uveitis and not a simple iritis or even iridocyclitis. J. B. Thomas.

Yanes, T. R., and Ferrer, O. Spontaneous bilateral uveitis with dysacusia, alopecia, and poliosis. *Rev. Cubana de Oto-Neuro-Oft.*, 1938, v. 7, Jan.-Feb., p. 5.

The authors review in some detail the literature on the subject of uveitis associated with dysacusia, alopecia, and poliosis, and report two additional cases with complete clinical and laboratory findings. Edward P. Burch.

8

GLAUCOMA AND OCULAR TENSION

Allmaras, Fritz. Observations on a glaucoma family. *Zeit. f. Augenh.*, 1938, v. 95, Aug., p. 276.

The author gives a family tree in which eleven members of two generations had chronic simple glaucoma. Eight of the patients were women. He adds very brief notes on the eyes of the affected members. The four who were operated upon reacted well to trephining. This glaucoma form seems to be inherited directly and dominantly.

F. Herbert Haessler.

Barkan, Otto. Glaucoma: classification, causes, and surgical control. *Amer.*

Jour. Ophth., 1938, v. 21, Oct., pp. 1099-1114.

Bordeaux. The surgical treatment of glaucoma. Bull. Soc. Franç. d'Opht., 1937, v. 50, p. 142.

The author seeks amelioration and cure of glaucoma in its various forms by means of a modified Elliot technique. Under local anesthesia, a conjunctival flap is dissected down to the limbus, and the episcleral fascia is incised. With the galvanocautery, an opening is then made in the sclera, the point of contact of the cautery being 1 mm. from the insertion of the conjunctiva. By successive applications the hole is enlarged to 3 mm. The charred tissue is curetted away, a thin spatula is introduced, and the root of the iris and the angle of Schlemm are freed. The flap is replaced and sutured.

The author used the method sixty times, in all types of glaucoma. In 47 patients the tension was restored to a value of 25 mm. Hg (Schiötz) or less. In several cases a repetition of the operation was necessary to obtain the desired result. Clarence W. Rainey.

Fahmy, A. Y. Histopathology of a case of capsular glaucoma. Bull. Ophth. Soc. Egypt, 1936, v. 29, p. 164.

A case of glaucoma capsularis of Vogt in a patient of 75 years is described. There were capsular exfoliations of the lens, with fluffy felt-like tufts at the pupillary margin. No increase in tension was observed even under dilatation. Microscopic sections showed refractile granular masses on the posterior surface of the iris, with pigment granules and refractile masses adherent to the thickened anterior lens capsule. Edna M. Reynolds.

Fialho, Abreu, Jr. Spontaneous oscillations of ocular tension. Trabalhos

do Primeiro Cong. Brasileiro de Ophth., 1936, v. 1, pp. 315-324.

The author studied normal and glaucomatous eyes to determine the behavior of ocular tension throughout the day. The Schiötz tonometer was used. The nine patients presented normal eyes, and eyes with chronic simple, absolute, or secondary glaucoma. Fifteen conclusions are presented, the most important being as follows: Ocular tension varies during the day in both normal and glaucomatous eyes. As a rule, tension is higher in the morning than at night. Variations of tension are greater in glaucomatous than in normal eyes. In about 20 percent of normal eyes these variations do not occur. In only 8 percent of the eyes with chronic simple glaucoma were there no variations of tension during the day.

Ramon Castroviejo.

Mueller, Friedrich. As to insistence upon treating glaucoma without operation. Trabalhos do Primeiro Cong. Brasileiro de Ophth., 1936, v. 1, pp. 337-341.

The author discusses the different medical treatments reported in the literature for the care of glaucoma. The effect of irritation of the sympathetic upon ocular tension is also briefly discussed. Ramon Castroviejo.

Mueller, Friedrich. Glaucoma and pseudoglaucoma. Trabalhos do Primeiro Cong. Brasileiro de Ophth., 1936, v. 1, pp. 333-336.

The author discusses briefly some reports of Salzer and Thiel concerning glaucomatous symptoms in eyes without increase of ocular tension. According to the author, the term "pseudoglaucoma" or "glaucoma without increased tension" is incorrect. These are

really eyes in which instead of true glaucoma, there are other changes which simulate glaucomatous changes in the visual fields. Such field changes may be due to pressure upon the optic nerve by extraocular vessels or to degeneration of the optic nerve on account of circulatory disturbances.

Ramon Castroviejo.

Nemeth, Lajos. The constitution of glaucoma patients. *Klin. M. f. Augenh.*, 1938, v. 101, Aug., p. 222.

Fifty male patients with primary glaucoma from the eye clinics of Berlin and Budapest were followed up for several years with regard to types of constitution. Inflammatory glaucoma predominated in pyknotics, simplex in the asthenic type. In asthenics glaucoma sets in earlier, can be less influenced, and progresses more rapidly than in pyknotics. The blood pressure in asthenic glaucoma patients averages lower. Great climatic fluctuations render the therapy of a glaucomatous attack more difficult. In asthenics quieting of the nervous system, in pyknotics treatment of the vascular system is essential for preventing an acute attack.

C. Zimmermann.

Poos, F. Uveal vascular reactions and intraocular pressure. *Klin. M. f. Augenh.*, 1938, v. 101, Aug., p. 210.

Under conditions simulating inflammatory hypotony, the author attempted experimentally to increase and decrease locally the hydrostatic pressure of the blood in the capillaries. He also observed the behavior of intraocular tension. His results justify the assumption that the fluctuations of intraocular tension after toxic damage to the uveal terminal circulatory channels, and at first also in every acute inflammation,

are due to fluctuations of hydrostatic pressure in the capillaries.

C. Zimmermann.

9

CRYSTALLINE LENS

Berens, C., and Bogart, D. Immediate operative complications of cataract. *Rev. Cubana de Oto-Neuro-Oft.*, 1938, v. 7, Jan.-Feb., p. 27.

A brief analysis with respect to the immediate operative complications of 1,004 cataract extractions performed at the New York Eye and Ear Infirmary is presented, with recommendations as to their prevention.

Edward P. Burch.

Borley, W. E., and Tainter, M. L. Influence of dinitrophenol on the production of experimental cataracts by lactose. *Amer. Jour. Ophth.*, 1938, v. 21, Oct. pp. 1091-1098.

Bourne, M. C., Campbell, D. A., and Pyke, M. Cataract associated with an hereditary retinal lesion in rats. *Brit. Jour. Ophth.*, 1938, v. 22, Oct., pp. 608-613. (See Section 10, Retina and vitreous.)

Bueckler, M. Concerning the pathogenesis of zonular cataract. *Klin. Woch.*, 1938, v. 17, Sept. 17, p. 1325.

Two different groups must be distinguished. The pathogenesis of one is endogenous, of the other exogenous. An endogenous origin must be assumed for those zonular opacities which have their seat in the embryonic nucleus and are often hereditary. An exogenous genesis in connection with a constitutional pathologic condition must be assumed for the zonular cataracts, always bilateral, which are located in more or less extensive cortical zones around the embryonic nucleus and which therefore were developed post partum.

The etiologic factors which produce this latter group are largely unknown. The author could not confirm a regular association of this type of cataract with rickets or infantile tetany, two factors to which general opinion attributes it. For solution of this problem more exact classification and sharp separation of the various types are necessary.

Bertha A. Klien.

Bunge, E. The cholesterin content of normal and cataractous human lenses. *Graefe's Arch.*, 1938, v. 139, pt. 1, pp. 50-61.

Forty-four normal and fifteen intracapsularly extracted cataractous lenses were investigated as to their content of cholesterin. During life, the total amount of cholesterin in the normal human lens increases to about five times that in the new-born. Lenses with mature cataract show a normal absolute amount of cholesterin.

H. D. Lamb.

El-Atawi, M. A. Ectopia lentis. *Bull. Ophth. Soc. Egypt*, 1936, v. 29, p. 159.

A case of ectopia lentis is described in which the right lens was dislocated up and out and the left lens down and in. A brief discussion of the frequency of ectopia lentis, the position of displacement, its causes, clinical signs, and treatment is included.

Edna M. Reynolds.

Fahmy, A. Y. Elschnig-Török-Stanculeanu's intracapsular extraction. *Bull. Ophth. Soc. Egypt*, 1936, v. 29, p. 136.

The results of 160 cases of intracapsular cataract extraction are reported.

Edna M. Reynolds.

Finlay, C. E. Treatment of incipient cataract by means of vitamin C. *Rev.*

Cubana de Oto-Neuro-Oft., 1938, v. 7, March-April, p. 33.

The author reviews experimental work on the relationship between cataract and avitaminosis with respect to vitamin C, and tabulates his own results in treatment of cataract with vitamin C. Careful determinations were made of the concentration of the vitamin in the blood and urine, the methods of determination being described. The cases treated are divided into two groups, those with vision of 20/100 or better and those with vision less than 20/100. Of the former group of nine patients, six exhibited definite and three doubtful improvement. Of the latter group none were benefited.

The author concludes that in senile cataract there is a deficit of vitamin C and glutathione in the lens which increases as the lens opacity progresses; that this deficit may be demonstrated in the blood and urine; that, if the cataract is not advanced, benefit may be expected from ingestion of some source of vitamin C either orally, intravenously or by conjunctival instillation; and finally that there is a little hope of success from this method of therapy in advanced cases. Edward P. Burch.

Hoffmann-Rötzel, F. W. Erythropsia of aphakics. *Zeit. f. Augenh.*, 1938, v. 95, Sept., p. 323.

The aged author, who had both eyes operated upon for cataract when he was sixty years old, has had ample opportunity to observe erythropsia. He describes in detail his observations of color phenomena. He feels sure that erythropsia is not a phenomenon of excessive illumination as claimed by some, but depends on an achromatism which results from dispersion of light rays. The cause is purely physical and depends on the presence of an excess

of red rays in the light of the rising and setting sun and that reflected from the snow.
F. Herbert Haessler.

Laval, Joseph. Bilateral congenital ectopia lentis with arachnodactyly (Marfan's syndrome). *Arch. of Ophth.*, 1938, v. 20, Sept., pp. 371-374.

After a brief résumé of the various signs and symptoms of this syndrome, two cases with this condition are reported. The author discusses the terminology and suggests that the term dysmesdactyly be adopted when the chromosomes concerned with mesodermal tissue are involved and dysmesectopia when the ectodermal tissue is also affected.
J. Hewitt Judd.

Purtscher, Ernst. Clouds of crystals in the clear senile lens-nucleus. *Graefe's Arch.*, 1938, v. 139, pt. 2, pp. 358-366.

Among seven patients, between 65 and 80 years of age, there were observed in the otherwise clear sclerotic lens-nucleus collections of very fine crystals, needle- or plate-shaped. In the beam of the slitlamp, they varied from red to green in color. The position of the crystals in the lens nucleus differed, but they were generally more numerous in the vicinity of the lens axis near the surface of the nucleus.

H. D. Lamb.

Rosner, L., Farmer, C. J., and Bellows, J. Biochemistry of the lens. 12. Studies on glutathione in the crystalline lens. *Arch. of Ophth.*, 1938, v. 20, Sept., pp. 417-426.

Evidence is presented indicating that the difference in potential between the cortical and nuclear portions of the lens, found by potentiometric studies, is due to a change in the concentration of glutathione. Studies of the concentration of glutathione in the lens indi-

cate that the concentration of the nucleus remains relatively constant while that of the cortex varies significantly with age. When animals were fed galactose, the glutathione in the lenses diminished. In young animals the appearance of cataract followed shortly after the loss of glutathione, while in older animals such a loss might occur long before the appearance of opacities. The sharp change in potential found with small variations in the glutathione-beta crystalline ratio may be a more sensitive method than actual chemical determination for estimation of glutathione when it is present in small quantities.
J. Hewitt Judd.

Zeiss, Erich. Lens changes from the action of ultrasound waves on extracted cattle lenses. *Graefe's Arch.*, 1938, v. 139, pt. 2, pp. 301-324.

Ultrasound waves being those in the air of more than 35,000 alternations per second are not transmitted to the human tympanic membrane. Ultrasound waves in this experiment are produced by causing a disc of quartz to vibrate by subjecting it to a high frequency current of electricity. The extracted cattle lenses placed in Ringer's solution and subjected to the ultrasound waves for from two to twelve minutes present vesicle-like opacities deep in the cortex. Longer ultrasound waves produce coarser or larger vesicles in the lens. When normal vitreous humor from cattle is subjected to these waves, it is found to liquify.
H. D. Lamb.

10

RETINA AND VITREOUS

Allen, T. D. Detachment of the retina. *Arch. of Ophth.*, 1938, v. 20, Aug., pp. 307-314.

This review includes a summary of

the theories on etiology and of the types of treatment devised to correct these conditions by the surgeons having the greatest experience, especially Gonin, Lindner, and Arruga.

J. Hewitt Judd.

Bourne, M. C., Campbell, D. A., and Pyke, M. Cataract associated with an hereditary retinal lesion in rats. *Brit. Jour. Ophth.*, 1938, v. 22, Oct., pp. 608-613.

Attention was attracted, some three years previous to the compilation of this article, to rats affected with such cataract, the rats being in a research laboratory for breeding purposes and not for experimental procedure. The rats appeared otherwise well, and reproduced as expected. A hereditary factor was sought. A cataractous female rat with a litter of eleven was first received for study, and six generations of rats were bred and studied. The cataract appeared in successive generations. There were no deaths other than from middle-ear disease or "rat pneumonia." Diet and housing were all that should be expected for normal rat living. The progress of the cataract is described, age limitations for the various stages being noted. A definite cause has not been found. It is not due to disturbance of blood supply or from metabolic interference. The point that some abnormality in the vitreous body or in the lens capsule may be more directly to blame for the cataract than the retinal lesion itself is being more fully investigated. (See next abstract.) (References, figures.)

D. F. Harbridge.

Bourne, M. C., Campbell, D. A., and Tansley, K. Hereditary degeneration of the rat retina. *Brit. Jour. Ophth.*, 1938, v. 22, Oct., pp. 613-623.

(See preceding abstract.) There be-

ing few records of hereditary retinal defects in animals, the authors regard as of considerable importance this opportunity of studying the degeneration of such retinae through all stages. The first obvious appearance of the abnormality was at 21 days of age, while the terminal stage was noted at eighteen months or older. The degeneration is fully described through the various stages. A comparison of this hitherto unknown pathologic condition in rats with human retinitis pigmentosa is made, with the explanation that the resemblance is too close to pass unnoticed and unmentioned. (Figures, references.)

D. F. Harbridge.

Danielson, R. W., and Long, J. C. A case of retinal arterial occlusion with partial recovery. *Amer. Jour. Ophth.*, 1938, v. 21, Nov., pp. 1264-1265; also *Trans. Western Ophth. Soc.*, 1937, 4th mtg.

Dubois-Poulson. Oscillometry of the arteries of the extremities in thrombosis of the central retinal vein. *Bull. Soc. Franç. d'Ophth.*, 1937, v. 50, pp. 224-233.

The authors classify their cases into three groups, according to the oscillometric index. When the index was low, the presence of hypertension of the artery indicated diminution in caliber of the vessels, due to sclerosis. When the index was low, and the arterial pressure was normal, the subjects were young persons, who often complained of cold sensations, pallor of the extremities, and increased sweating. The author thinks that juvenile arteritis may account for these cases.

When the index is elevated in all four extremities, it is difficult to decide whether the trouble is vascular, or is caused by disturbed heart action. When the index is raised in the lower vessels

alone, its peripheral origin is undeniable. The index is elevated when there is vascular hypotony. It is augmented by hypertension.

Clarence W. Rainey.

Concilliis, Nicola de. *Retinal metabolism in narcosis*. *Boll. d'Ocul.*, 1938, v. 19, Jan., pp. 45-51.

The writer tested the effect of a narcotic of the uretan series on the retina of the ox. In different test tubes he put constant quantities of retina and methylen blue and phosphate in different concentrations. A solution of 1 to 5000 ethyl uretan was then added, while a physiologic solution was added in control tubes. The narcotic effect of the ethyl uretan was evidenced by the fact that five times as long was required for the retina to discolor the methylen. The results of the experiments are given in tabulated form, showing that the retina is highly sensitive to the narcotic action of the ethyl uretan. This is probably due to the fact that the retina is rich in lipoids.

Melchior Lombardo.

François, Jules. *Circinate degeneration of the retina and thrombosis of the macular veins*. *Bull. Soc. Belge d'Opht.*, 1938, no. 76, p. 54.

The author reports two cases in each of which the circinate degeneration of the retina followed thrombosis of the superior macular vein. He calls attention to the fact that a macular vein and not a more important branch of the central vein of the retina was thrombosed. The circinate degeneration began three or four months after the initial thrombosis, and on the opposite side. (2 illustrations, 21 references.)

J. B. Thomas.

Fritz. *The blood volume in the retinal vessels*. *Bull. Soc. Franç. d'Opht.*, 1937, v. 50, p. 209.

The blood volume in the retinal vessels appears as integration of all the factors affecting retinal circulation. The ease with which one can cause a granular current in the retinal vein is a measure of blood volume in the retinal artery. Physiologically, when one compresses the globe more and more, one sees in the retinal vein at a certain point a rapid current which is interrupted completely when the retinal artery collapses. After a certain pressure, M_n , corresponding to the index of suppleness of the artery, diastolic collapse of the artery is increasingly noticeable, whereas the amplitude of systolic pulsation decreases, to be effaced entirely at a pressure M_x . This progressive increase in pressure reduces the passage of blood in an arithmetical progression. It is as if the pressure were constant, with the cross section of the artery normal at M_n , and zero at pressure M_x .

If the volume of blood entering the retinal artery is large, the venous column is not fragmented until the pressure is near M_x , but if the volume of blood in the retinal artery is reduced from any cause, then fragmentation occurs in the vein at some pressure near M_n . The author uses as a criterion, the speed of venous globules of one disc diameter per second. He expresses the blood volume by the formula

$$D = k + k' \left(\frac{C.V.G. - M_n}{M_x - M_n} \right)$$

in which k and k' are constants, k being the volume when the fragmentation appears spontaneously in the neighborhood of M_n , and $k+k'$ being the volume when fragmentation occurs at M_x .

The normal value of blood volume in the retinal artery occurs when venous collapse coincides with the second half of arterial collapse, and averages 0.7. When fragmentation occurs in the first

half of arterial compression, a pathological condition is present.

Clarence W. Rainey.

Fritz. Functional examination of the circulation of blood in the retinal vessels. *Bull. Soc. Belge d'Ophth.*, 1938, no. 76, p. 45.

The author comments in detail upon the factors involved in an examination of the retinal circulation, such as degrees of pressure, differential pressure, caliber of the retinal artery, blood pressure in the retinal capillaries, and collapse of the artery. (2 tables, 25 references.)

J. B. Thomas.

Gandolfi, C. Bilateral blindness from anatomical and functional alterations in retinal circulation. *Rassegna Ital. d'Ottal.*, 1938, v. 7, May-June, pp. 287-300.

The author reports two cases of bilateral acute blindness occurring in elderly individuals, and which fall into the classification of occlusion of the central retinal artery. He discusses the affections of the retinal arteries from the point of view of etiopathogenesis and distinguishes two groups, functional and anatomical. The ophthalmodynamometer of Bailliant was used and the value of this instrument in such cases is stressed. Basing his data on clinical findings, and especially the study of pressure in retinal artery and vein, he shows that one case was functional and the other anatomical, that is, due to a lesion of the vessel wall.

Eugene M. Blake.

Genet, L., and Charpentier, R. Retinal spasm in fatal diseases, from lack of acetylcholine. *Bull. Soc. Franç. d'Ophth.*, 1937, v. 50, pp. 215-223.

The authors report treating with acetylcholine a 34-year-old man who had a

fatal angina pectoris. Their observations of the retinal arteries did not enable them to differentiate the grave forms of the disease. The views of physiologists are reviewed. The term "chemical transmitters" designates those substances which permit transmission of nerve impulses from a neuron to a muscular or glandular cell or to another neuron. The point of action of these substances is the point of junction. Two such substances are known. One is adrenalin, which acts on the sympathetic nerves; the other is acetylcholin, which acts on parasympathetic nerves. When acetylcholin is lacking, vascular spasm occurs. Acetylcholin was supplied in the hope of relaxing vascular spasm.

Clarence W. Rainey.

Gibson, G. G. Clinical significance of the retinal changes in leukemia. *Arch. of Ophth.*, 1938, v. 20, Sept., pp. 364-370.

This report is based on the study of 22 cases in which the clinical diagnosis of leukemia was confirmed in nine cases at autopsy and in seven additional cases by biopsy. The ophthalmologic diagnosis and prognosis of leukemia are discussed and attention is called to the close parallelism between the amount of hemorrhage in the retina and the degree of anemia which is associated with the leukemia. The evidence presented suggests that therapeutic and investigative procedures should be directed toward the anemia instead of the leukocytosis in the unsolved problem of leukemia. (Discussion.)

J. Hewitt Judd.

Klien, B. A. Retinitis proliferans. *Arch. of Ophth.*, 1938, v. 20, Sept., pp. 427-436.

Several cases are presented to show that on the basis of clinical and histo-

logic studies it is possible to distinguish two types of retinitis proliferans and to deduce from the location and appearance of the plastic lesions the nature of the primary disturbance. In the first type, the exudation of hemorrhage from the retina into the vitreous, caused by inflammatory or traumatic alterations of the retinal vessels, is a primary event, and organization of the extravasation leads to the formation of the strand and membranes. In the second type, the main factor in the production of the plastic lesions is a slow circulatory impairment due to degenerative vascular disease, with formation of new compensating anastomotic channels, with or without hemorrhages at first. The retinitis is produced mainly by disturbance of venous circulation due to sclerotic changes of neighboring structures and preëxisting unfavorable topographic anatomic relationship. The differential diagnosis between the two types is clearly outlined and illustrated by fundus drawings and photomicrographs.

J. Hewitt Judd.

Kurz, Otto. Clinical aspect and pathogenesis of nonmyopic detachments of the retina (fixed detachment, retinal cysts, retinal splitting). *Graefe's Arch.*, 1938, v. 139, pt. 2, pp. 326-357.

In fixed detachment of the retina, the retinal tear is not so important, the retina is often transparent and the detachment vesicle-like or flat. Where ruptures exist, they frequently occur as separations at the ora serrata. Cysts in the retina are the primary factor, resulting either from traumatic influence or from congenital defects of development. Twenty-two such cases are tabulated in two groups. There are further tabulated seven cases (one bilateral) in which vesicle-like detachment of the retina was associated with peripheral

choroiditis and was therefore apparently caused by inflammatory exudate. Among 27 cases of retinal detachment operated upon by the method of Weve (diathermy-puncture), 21 were healed.

H. D. Lamb.

Kurz, Otto. Eye changes in lupus erythematosus. *Zeit. f. Augenh.*, 1938, v. 95, Sept., p. 315.

In a 24-year-old woman with lupus erythematosus, eye complications appeared during the three or four weeks before death. A phlyctenule-like papule developed at the limbus in the left eye, and four or five white protruding spots overlying the blood vessels appeared in the foveal region of the left fundus, accompanied by minimal edema and an occasional minute hemorrhage. Two days later, similar lesions appeared in the right fundus. In sections from the eyes obtained eight hours post mortem, it was seen that the retinal lesions consisted of gangliform degeneration of the nerve fibers. These clinical and histologic findings in a patient suffering from a severe septic affection characterize simple retinitis septica. It may occur as a transient lesion and end in complete recovery.

F. Herbert Haessler.

Lijo Pavia, J. Vitreous humor, incarceration in one eye and deposits on hyaloid membrane of each eye. *Revista Oto-Neuro-Oft.*, 1938, v. 13, Jan., p. 15.

The author describes a cone-shaped vitreous condensation occurring in one eye and whitish deposits on the hyaloid membrane of both eyes, in 31-year-old syphilitic patient. Edward P. Burch.

Paton, R. T. Recurrent retinal and vitreous hemorrhages in the young—Eales' disease. *Arch. of Ophth.*, 1938, v. 20, Aug., pp. 276-285.

The clinical manifestations of this

condition are reviewed and two cases are presented showing quite different fundus pictures. Both recovered, one with normal vision in each eye, and the other with restoration of two thirds of his sight in spite of a partially vascularized vitreous. The fundus changes are shown by drawings.

J. Hewitt Judd.

Perera, C. A. Retinitis pigmentosa with "hole" in the macula. *Arch. of Ophth.*, 1938, v. 20, Sept., pp. 471-474.

The literature is reviewed and this combination is reported in a 16-year-old girl whose parents were first cousins. The macular lesion developed in one eye while the patient was under observation. The author suggests that both the peripheral and central degenerative lesions were the results of local vascular disease and retinal deterioration.

J. Hewitt Judd.

Trantas, Nico. Operation for retinal detachment by diathermy coagulation, after the method of Weve. Retinal tears without detachment. *Bull. Soc. Franç. d'Opht.*, 1937, v. 50, pp. 234-239.

Success of operation for retinal detachment with a tear depends upon the best possible measurement of the location of the tear, and closure of the tear. The author takes the position of the ora serrata as basis for measurement. This is obtained by transillumination of the globe, placing the cone of the Lange lamp upon the opposite end of the lid, and conducting the ophthalmoscopic examination through a pupil dilated with atropin. Scuffing of the cornea by use of the contact glass is avoided by turning down over the cornea the conjunctival flap which is made in order to lay bare the sclera over the operative site. Incisions of the sclera at the site of the needle punctures aid in

puncturing the softened eyeball. Among sixteen cases operated upon there were twelve cures, one was improved, and three not benefited.

The author reviews reports of five cases of tear without detachment, and adds case reports of five more such cases studied by himself.

Clarence W. Rainey.

Valois, Jeandelize, Drouet, and Lemoine. Recurrent retinal hemorrhage, and endocrine disturbances. *Bull. Soc. Franç. d'Opht.*, 1937, v. 50, pp. 267-280.

A nineteen-year-old woman, soon after the birth of her first child, had recurring hemorrhage in each eye, together with cessation of the menses. As long as administration of thyroid was kept up, the hemorrhages improved and failed to recur. Addition of hypophyseal substance to the treatment caused recurrence of the menses.

Clarence W. Rainey.

Vogt, A., Wagner, H., and Schneiter, M. Investigations on the orientation of the normal structural membranes of the vitreous. *Klin. M. f. Augenh.*, 1938, v. 100, Aug., p. 235.

From thirty observations on normal youthful persons, the authors conclude that in erect position of the head the orientation of the structural membranes of the anterior vitreous is determined by the force of gravity.

C. Zimmermann.

Wibo and Rans. Prepapillary floating opacity of the vitreous. *Bull. Soc. Belge d'Opht.*, 1938, no. 76, p. 11.

The authors report a case of prepapillary floating opacity of the vitreous observed in a girl nine years old having atrophy of both papillae and discrete

areas of choroiditis. This condition is said to occur exclusively in adults.

J. B. Thomas.

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Benedict, W. L. Optic neuritis and retrobulbar neuritis: etiology and treatment. *Jour. Michigan State Med. Soc.*, 1937, v. 36, Dec., p. 946.

Benedict reports 500 cases of definitely proved multiple sclerosis, in 15 percent of which there was complaint of visual loss as the first symptom. In 40 percent visual disturbances were mentioned as the second or third symptom. Etiology and treatment are discussed. Theodore M. Shapira.

Fonseca, Aureliano. Amaurotic family idiocy. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 1, pp. 343-351.

The author reviews briefly cases of this condition reported in Brazil. He records one more case in a child born in Brazil, whose ancestors four generations back were born in Germany.

Ramon Castroviejo.

Fonseca, Aureliano. Ocular disturbances produced by rachianesthesia. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 1, pp. 353-354.

The author reports the case of a woman 35 years of age on whom a laparotomy was performed under rachianesthesia. A year after the operation very marked diminution of vision occurred, gradually leading to blindness of the right eye and counting fingers at six feet for the left eye. Ophthalmoscopy revealed marked atrophy of both optic nerves, and the author believes that this atrophy was produced by the rachianesthesia.

Ramon Castroviejo.

Giqueaux, R. E. Hereditary atrophy of the papillomacular bundle. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, March, p. 111.

This article describes the occurrence of hereditary atrophy of the papillomacular bundle in a family. Points of resemblance and dissimilarity to Leber's optic atrophy are discussed in detail. Myopia of slight or moderate degree was found in most of those affected. The disease, occurring bilaterally, begins at an early age. It is characterized by pallor of the temporal segment of the nerve head and a cecocentral scotoma. Females are affected as well as males.

Edward P. Burch.

Kravitz, Daniel. Studies of the visual fields in cases of verified tumor of the brain. *Arch. of Ophth.*, 1938, v. 20, Sept., pp. 437-470.

The findings as to 23 cases of verified tumor of the brain are presented in four groups: tumors of the frontal lobe, 6 cases; tumors in the region of the chiasm and the midbrain, 8 cases; tumors posterior to the chiasm, 6 cases; and tumors of the posterior fossa, 3 cases. The visual fields in the fourteen cases in groups 2 and 3, which might be expected to present localizing defects, showed signs of definite localizing value in 86 percent. From a diagnostic standpoint, a correct negative field may be as important to the neurosurgeon as a positive one. Of the nine cases of tumor in the frontal and posterior fossa eight, correctly, showed no localizing defect. The value of the visual fields is evident, since neurologic examinations gave correct results in only 70 percent of these cases. It is urged that every patient with persistent headache or other signs suggestive of possible tumor

should have an examination of the visual fields. J. Hewitt Judd.

Luzsa, Endre. The influence of enucleation on the development of the optic canal. *Klin. M. f. Augenh.*, 1938, v. 101, Sept., p. 413.

In the living, the roentgenogram alone can demonstrate changes in the optic canal; and then only if compared with that obtained under equal circumstances for the other side. Luzsa studied this problem in 37 individuals, in each of which one eye had been enucleated—in four before the eighteenth year and in twenty after the twentieth year. In 15 further cases with enucleation between three and twenty years of age the canal on the side of enucleation was smaller than on the intact side, with one exception. The author found that the development of the optic canal terminated at about the eighteenth year. After enucleation before that time the development of the canal was retarded in consequence of atrophy of the optic nerve, and in the roentgenogram it appears narrow as compared with the healthy side.

C. Zimmermann.

Mueller, Friedrich. Atrophy of the optic nerve of unknown etiology. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 1, pp. 329-330.

The author reports such a case.

Samuels, Bernard. The histopathology of papilledema. *Amer. Jour. Ophth.*, 1938, v. 21, Nov., pp. 1242-1258.

Sloan, L. L., and Woods, A. C. Perimetric studies in syphilitic optic neuropathies. *Arch. of Ophth.*, 1938, v. 20, Aug., pp. 201-253.

After a historical survey, the authors report the field defects in a group of 56 patients with primary syphilitic optic

atrophy, which were of four separate types: (1) concentric contraction of the peripheral field associated with late loss of vision; (2) sector-shaped, or nerve-bundle, defects, with which loss of vision might be early or late, depending on the involvement of the papillomacular bundle; (3) central or cecentral scotoma with normal peripheral fields, associated with early loss of visual acuity; and (4) central or cecentral scotoma with defects in the peripheral fields, also associated with early loss of vision. Central or cecentral scotoma was found in 53 percent of the cases of primary atrophy of the optic nerve. These studies indicate that perimetric changes may antedate either visual failure or pallor of the disc, and that the site of the lesion responsible for the field defects is in the optic nerve rather than in the chiasm or posterior to it and is probably a peripheral and interstitial neuritis with secondary degeneration. J. Hewitt Judd.

Vail, Derrick. Optochiasmic arachnoiditis. Importance of a mixed type of atrophy of the optic nerve as a diagnostic sign. *Arch. of Ophth.*, 1938, v. 20, Sept., pp. 384-394.

Study of the cases reported in the literature, associated with the clinical findings in two personal cases reported in detail, suggests that the involvement of the optic nerve is a combination of papilledema and simple atrophy. One or the other may predominate and the resulting atrophy will take on a mixed character. This appearance, in which the outline of the disc is sharply defined and the lamina cribrosa is visible, but the caliber of the vessels is markedly reduced, is highly suggestive if not pathognomonic of arachnoiditis involving the chiasm. Recent evidence indicates that encephalitis, multiple

sclerosis, other demyelinating diseases, sinusitis or focal infections, and optochiasmic arachnoiditis may be closely allied factors in producing retrobulbar optic neuritis and may be different manifestations of a single pathogenic process such as thrombosis in the venous system of the nerve tissue. (Bibliography.) J. Hewitt Judd.

Vidal, J., and de Farias, N. Treatment of optic-nerve atrophy by inoculation of malaria. *Trabalhos do Primeiro Cong. Brasileiro de Opth.*, 1936, v. 1, pp. 325-327.

The authors obtained marked improvement of vision in a single case so treated. The treatment should include iodides and bismuth.

Ramon Castroviejo.

12

VISUAL TRACTS AND CENTERS

Custodis, Ernst. Anatomic investigation and clinical observations on the syndrome of pterygopalatine-fossa lesions. *Zeit. f. Augenh.*, 1938, v. 95, Aug., p. 259.

Isolated synchronous and homonymous paralysis of the second ramus of the trigeminal nerve and of the abducens does not indicate a tumor of the pterygopalatine fossa. A tumor in this situation cannot involve these nerves by means of such pressure or infiltration without including the neighboring oculomotor nerves. The injury is caused by a malignant neoplasm which arises in the epipharynx and traverses the root of the pterygoid process. In the author's case, with further extension along the base of the cranium, destruction of the apex of the petrous portion of the temporal bone produced paralysis of the sixth nerve. Other fibers frequently involved are the secre-

tory fibers of the lacrimal gland, the third branch of the trigeminus, and the sympathetic fibers.

F. Herbert Haessler.

Genet, L., and Rosnoblet. Blindness without ophthalmoscopic signs in an infant; congenital form. *Bull. Soc. Franç. d'Opht.*, 1937, v. 50, pp. 240-246.

The authors report the case of a thirteenth-month-old infant whose parents had noted lack of vision when the infant was six months old. There had been no previous local or general diseases. The results of the physical and laboratory examinations were negative. There were no external or internal abnormalities of the eyes. There was only a slight pupillary response to light. Agenesis of the intracerebral optic pathways was considered as a possible cause. Clarence W. Rainey.

Oliva, Roberto. Ocular symptoms in affections of the apex of the petrous portion of the temporal bone. *Trabalhos do Primeiro Cong. Brasileiro de Opth.*, 1936, v. 1, pp. 357-360.

The author discusses briefly the relation between the fifth and sixth nerves, and the affections of the apex of the petrous bone. The symptoms that most directly interest the ophthalmologist are produced by paralysis of the abducens and neuralgia of the trigeminus, the first condition being known as the syndrome of Gradenigo. The author reports two cases, and urges ophthalmologists to be on the lookout for characteristic symptoms.

Ramon Castroviejo.

Paiva, Aroldo. Suboccipital puncture from the ophthalmologic viewpoint in cranial injuries. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, Feb., p. 92.

Cisternal puncture for relief of in-



creased intracranial pressure complicating head injuries is advocated by the author. He believes it to be superior to lumbar puncture. A brief summary of four cases of head injury treated by suboccipital puncture is given. The author would extend this method of treatment to other types of intracranial hypertension which might give rise to optic-nerve changes.

Edward P. Burch.

Pesme, P., and Hirtz. Observations of the syndrome of Laurence-Bardet-Biedl. *Bull. Soc. Franç. d'Opht.*, 1937, v. 50, pp. 297-310.

The authors report their observations of four cases, three males and one female, all under the age of sixteen years, who presented the picture of obesity of the hypophyseal type—genital hypoplasia, waxy pallor of the discs, ashy-gray changes at the macula, and peripheral retinal changes, described as retinal degeneration without pigment. The symptom of polydactyly was absent. The authors were able to obtain marked improvement in one patient by multiglandular therapy.

Clarence W. Rainey.

Wauters, Marcel. A case of bilateral amaurosis following abortion. *Bull. Soc. Belge d'Opht.*, 1938, no. 76, p. 59.

The patient, 28 years of age, and three months pregnant, attempted abortion by intrauterine injection of a solution of soap. A few minutes after the injection she became unconscious and vomited. A few hours later, upon regaining consciousness in a hospital, she declared that she was totally blind. The same night she expelled two fetuses 5 cm. in length. The loss of blood was not severe. In a week her vision had returned to normal. The author attributed the amaurosis to intoxication

caused by the absorption of soap by the uterine mucosa. In discussing the report Coppez stated his belief that the amaurosis had been simulated. (13 references.)

J. B. Thomas.

13

EYEBALL AND ORBIT

Auffinger, Erwin. Contributions to a solution of the problem of implantation of spheres after enucleation. *Zeit. f. Augenh.*, 1938, v. 95, Aug., p. 241.

Of 58 implants of bone, more than 49 were retained, and the result was considered satisfactory in all but eight of these. Nevertheless, for several reasons, the author discontinued the use of a bone sphere. The least of these was persistently irritated conjunctiva with copious tearing and mucopurulent exudate which might last for months. Sometimes the implant, although retained, became exposed through pressure atrophy and necrosis of the tissues. When a bone sphere had to be removed, it was found to be traversed by organized granulation tissue, and excision was extremely difficult. Local anesthesia was usually inadequate.

In six patients, the author implanted cartilage, but in four of them the sphere was extruded. In the end, spheres of amber were considered the most satisfactory. They are readily sterilized, are well tolerated by the tissues, resist absorption, and are easily made in any required size. A 15-mm. sphere weighs 1.5 gm. When amber spheres are extruded, they come away easily and cause no injury.

At the time of enucleation, the author threads all four rectus muscles on a single suture before cutting them. A special speculum with eight hooks helps keep the suture from becoming entangled. If this suture is tied as a

purse string, it forms a muscular stump which is useful even when the implant is lost.
F. Herbert Haessler.

François, J. Voluminous bony tumor of the external wall of the orbit, the great wing of the sphenoid, and the temporal fossa. *Bull. Soc. Franç. d'Ophth.*, 1937, v. 50, pp. 281-296.

A 45-year-old woman presented herself because of progressive exophthalmos of the right eye and swelling in the right temporal fossa. There was X-ray evidence of a large bony tumor. No operation was done.

Clarence W. Rainey.

Friede, Reinhard. A practical chalazion suture. *Graefe's Arch.*, 1938, v. 139, pt. 2, pp. 325.

Where bleeding persists after excision of the chalazion through the skin, the author recommends a double-armed suture at each side of the wound, passing through skin, orbicularis muscle, and tarsus, tightened and tied.

H. D. Lamb.

Groenouw. A case of spontaneous orbital hemorrhage. *Klin. M. f. Augenh.* 1938, v. 101, Sept., p. 420.

On March 8, 1938, a woman aged 61 years came on account of sudden amaurosis of the hitherto perfectly healthy left eye, with headache and vomiting. There was ecchymosis under the skin of the lids, and bloody discoloration of the lower half of the ocular conjunctiva; with exophthalmos upward and limited motility. The pupil did not react directly to light, but did consensually. The fundus was normal, but vision was limited to light perception. Two weeks later the lateral half of the optic disc was pale, and after six weeks more the whole disc was completely white and the visual field

concentrically contracted. The condition was undoubtedly caused by a hemorrhage into the orbit due to a local affection of the orbital blood vessels.

C. Zimmermann.

Jaeger, Antoine de. Notes on certain cases of infection of the orbit. *Bull. Soc. Belge d'Ophth.*, 1938, no. 76, p. 63.

The writer classifies infections of the orbit according to Birch-Hirschfeld, as follows: (1) inflammatory edema of the orbit; (2) inflammation of the bony wall and periosteum of the orbit, especially in connection with sinusitis; (3) phlegmon of the orbit or orbital thrombophlebitis; (4) syphilis and tuberculosis of the orbit; and (5) tenonitis and pseudo-inflammatory tumors. Several case histories are reported illustrating these various types of infection. Two cases of retrobulbar phlegmon followed dacryocystorhinostomy done for acute dacryocystitis. In the discussion this procedure during the acute stage of a dacryocystitis was criticized, as was also simple extirpation of the sac in like circumstances. (4 X-ray plates).

J. B. Thomas.

Krause, A. C., and Weekers, R. Inositol in the ocular tissues. *Arch. of Ophth.*, 1938, v. 20, Aug., pp. 299-303.

Inositol was found in all tissues of the globe, with the possible exception of the vitreous. It was relatively constant in concentration in the different types of tissue but varied in different tissues. Concentration was high in the lens and in the optic nerve. It is thought that inositol may be a stable form of metabolite in the tissues which have no glycogen or only a small amount of it.

J. Hewitt Judd.

Kurz, Otto. Blood cyst of the orbit. *Klin. M. f. Augenh.*, 1938, v. 101, Sept., p. 405.

A girl aged seventeen years had noticed three weeks previously a sudden swelling and blue discoloration of her left upper lid, with exophthalmos, pain, and diplopia. At the nasal side of the eyeball an elastic movable resistance could be felt. The optic disc was indistinct, about five diopters prominent, with peripapillary edema. and vision 6/12. A bluish cystic tumor was extirpated from the depth of the orbit. It was a hematoma with a wall of connective tissue and with a vascular convolution at its posterior end. It was interpreted as the product of a thrombus in the ectatic venous convolution, caused through stasis during strenuous work, to which adenoid vegetations may have contributed as a respiratory impediment. The eliciting factor may have been vasomotor insufficiency during the menstrual cycle.

C. Zimmermann.

Meyer, K., and Smyth, E. M. On the nature of the ocular fluids. 2. The hexosamine content. *Amer. Jour. Ophth.*, 1938, v. 21, Oct., pp. 1083-1090.

Smelser, G. K. Treatment of experimentally produced exophthalmos with thyroxin and other iodine compounds. *Amer. Jour. Ophth.*, 1938, v. 21, Nov., pp. 1208-1218.

14

EYELIDS AND LACRIMAL APPARATUS

Fazakas, Alexander. Congenital symmetric ocular anomalies. *Klin. M. f. Augenh.*, 1938, v. 101, Aug., p. 257.

In investigating anomalies of the tear passages the author found numerous disturbances of development in the upper part of the lacrimal drainage tubes and around the whole palpebral opening. These he describes in detail.

C. Zimmermann.

Gernet, R. Remarks on the Blaskovics ptosis operation. *Klin. M. f. Augenh.*, 1938, v. 101, Sept., p. 422.

The simplified method described removes the deformities without resorting to implantation of auricular cartilage, regarded by Blaskovics as the only possibility for correcting such conditions.

C. Zimmermann.

Kreibig, Wilhelm. Plastic reconstruction of the lids. *Zeit. f. Augenh.*, 1938, v. 95, Aug., p. 269.

To make a new upper lid, the author uses a large pedunculated flap whose base is in front of the ear and which extends forward over and to the inner end of the eyebrow. It is important that the end of the upper incision near the ear shall lie at the level of the upper edge of the eyelid.

F. Herbert Haessler.

Lijo Pavia, J. Marked bilateral inflammatory ectropion. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, March, p. 149. (See *Amer. Jour. Ophth.*, 1938, v. 21, Dec., p. 1423.)

Mirič, B. A simple operation for entropion and trichiasis due to trachoma. *Klin. M. f. Augenh.*, 1938, v. 101, Sept., p. 381.

On account of the unsatisfactory results of the usual operations for entropion and trichiasis, the author devised a new method which in 161 cases gave good therapeutic and cosmetic results, and which is described in detail with illustrations. By stitching the separated upper part of the tarsus into the wound along the ciliary margin, the contracting effect of the levator is displaced to a lower point and its function increased, so that it supports aversion of the lid margin and cilia from the eyeball.

C. Zimmermann.

Mohamed, I. A. **Trachoma of the lacrimal apparatus.** Bull. Ophth. Soc. Egypt, 1936, v. 29, p. 7.

Since the lacrimal apparatus normally contains lymphocytic adenoid elements, a simple chronic inflammation may easily be mistaken for a specific trachomatous inflammation. Histopathologic studies give inconclusive evidence as to whether or not trachoma primarily attacks the lacrimal apparatus. A careful review of the literature is given. Photomicrographs of cystic dilation of the ducts of the lacrimal gland ascribed to gradual incomplete or intermittent obstruction of the lacrimal outflow following cicatricial processes in the conjunctiva are shown, as well as several photographs of follicular dacryocystitis corresponding to all stages of trachoma.

Edna M. Reynolds.

Southgate, Paul. **A treatment for chronic dacryocystitis.** Amer. Jour. Ophth., 1938, v. 21, Oct., pp. 1158-1161.

15

TUMORS

Appelmans. **Treatment of epithelioma of the eyelids.** Bull. Soc. Belge d'Ophth., 1938, no. 76, p. 75.

Basocellular or tubular epithelioma represents about 70 percent of these cases, the spino-cellular or lobulated form 15 percent, and the mixed form the remaining 15 percent. Epithelioma of the lid is preceded by a precancerous lesion in about 20 percent of all cases. The most important criterion for judging the gravity of a palpebral epithelioma is the age of the lesion, that is, its stage of evolution. The treatment described is that practiced by Maisin at the Cancer Institute of Louvain. Radium therapy is preferred and the

results were happy in 134 out of a total of 150 cases thus treated. As to the permanence of these favorable results, 7 had remained cured for at least 10 years, 6 for 9 years, 3 for 8 years, and 5 for 7 years. It is admitted that cataract may follow in a certain percentage of cases in which treatment has been energetic or prolonged but in view of the gravity of the disease the radium treatment should not be condemned. In the problem of cancer one must bear in mind that the individual tumor is not all. The study of precancerous lesions and the observation of multiple cancers show that the general condition must have a part in the genesis of cancer. Radium cures the local lesion but the cancerous tendency remains, so these patients must be kept under observation. In discussing the paper, Hubin stated that he had abandoned radium in favor of diathermy coagulation, using the unipolar method (without indifferent electrode). Weekers noted that diathermy was more convenient, was less costly for the patient, and left a scar comparable with that of radium. He insisted on the importance of the oculist directing the treatment of these cases, assisted by the radiologist and dermatologist. (16 references.)

J. B. Thomas.

Binkley, G. W., and Motto, M. P. **Primary epibulbar prickle-cell epithelioma.** Amer. Jour. Ophth., 1938, v. 21, Oct., pp. 1156-1158.

Birge, H. L. **Cancer of the eyelids, conjunctiva, and cornea. 2. Squamous cell epithelioma.** Arch. of Ophth., 1938, v. 20, Aug., pp. 254-270.

This condition was found in 59 out of 230 cases of epithelioma. It originated from the conjunctival surfaces, including the cornea, in 37 percent. Primary

corneal involvement occurred in 5 percent. The malignancy of most of the lesions was either grade two or grade three. There was a close correlation between clinical behavior and grade of malignancy; and recurrences were frequent. The average mortality of all types was about 12 percent. The grade of malignancy should be determined first, and treatment proportional with this rating should be carried out in order to prevent recurrences. The article includes eight case reports and photographs of various types of the tumor.

J. Hewitt Judd.

Capuano, Attilio Jose. Contribution to the study of sarcoma of the choroid. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 1, pp. 281-287.

The author reviews some cases from the literature and reports one in a patient 42 years of age. Ophthalmoscopic examination of the eye seemed to show characteristics of endophthalmitis, but finally a diagnosis of sarcoma of the choroid was made. Microscopic examination revealed a spindle-cell sarcoma.

Ramon Castroviejo.

Dunnington, J. H. Intraocular tension in cases of sarcoma of the choroid and ciliary body. *Arch. of Ophth.*, 1938, v. 20, Sept., pp. 359-363.

An analysis of 55 cases of intraocular sarcoma was made to determine the diagnostic value of intraocular tension in differential diagnosis between a serous detachment of the retina and one due to an intraocular tumor. In nine cases a definite secondary glaucoma had occurred. In 29 of the remaining 46 cases, the tension of the affected eye was found to be lower than that of the sound eye. In eleven the pressure was equal, while in six the affected eye showed a slightly higher

tension. The decrease, which varied from 2 to 10 mm. of mercury, was found as frequently when the tumor originated in the choroid as when it started in the ciliary body. The conclusion is reached that an initial drop in intraocular tension is the rule rather than the exception in the early stages of sarcoma of the choroid and ciliary body.

J. Hewitt Judd.

François, J. Aneurysmal dilatation of the ophthalmic artery. (Melanosarcoma.) *Bull. Soc. Franç. d'Opht.*, 1937, v. 50, pp. 264-266.

Previously the author had reported an aneurysmal dilatation of the ophthalmic artery, with superior pseudohemianopsia, reduction of the visual acuity to 0.5, papillary stasis, and mild hypertension of the cerebrospinal fluid. Operation had revealed involvement of the optic nerve near the optic foramen, with a gray violaceous mass which was the artery doubled in volume. Subsequently the vision diminished, the retina became detached, and the tension rose. In the enucleated eye a pea-sized melanosarcoma was found.

Clarence W. Rainey.

Kronenberg, Bernard. Topography and frequency of complications of uveal sarcoma. *Arch. of Ophth.*, 1938, v. 20, Aug., pp. 290-298.

Most tumors are localized posteriorly and temporally. Eighty-eight percent of the 126 cases of uveal sarcomas were located in the choroid. There was an equal distribution between the two sexes and the average age was 52.6 years. The predominant type was the spindle-cell sarcoma. Almost all circumpapillary sarcomas caused detachment of the retina, and this complication occurred in more than 75 percent of all of these cases. The topographic

disturbance does not influence the frequency of glaucoma, which was found to be present in half of the eyes of this series. The site of the sarcoma has no bearing on the frequency of extra-ocular extension, which occurred in 36.1 percent. J. Hewitt Judd.

Lijo Pavia, J. Primary sarcoma of the choroid; early diagnosis; enucleation of eye having normal vision. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 1, pp. 276-279.

In a patient 27 years of age a small growth was found near the left macula. Visual fields taken at short intervals after the first examination showed the blind area to be growing larger. Microscopic examination of the enucleated eye proved the clinical diagnosis to be correct, the tumor being a melanosarcoma of the choroid.

Ramon Castroviejo.

Mathis, G. A case of leucosarcoma of the choroid. *Rassegna Ital. d'Ottal.*, 1938, v. 7., May-June, pp. 408-415.

The patient was a man of 71 years whose left eye had been blind for four years and had previously been treated for glaucoma. A small mass was seen in the anterior chamber in the lower nasal quadrant, at the root of the iris. Upon removal of the eye a mass was found on the outside of the globe, at the corresponding point, measuring 13 by 15 by 5 mm. When the globe was sectioned a tumor mass was found at the base of the iris, measuring 10 by 12 mm. Thus the extrabulbar portion of the tumor was greater than the intra-ocular. The cells were polymorphous and no pigment was found in them. At the point of perforation the scleral lamellae were widely separated. (3 figures.) Eugene M. Blake.

Mueller, F. Extirpation of a carcinoma of the lower eyelid and plastic repair of the defect. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 1, pp. 249-250.

The defect was covered with sliding skin flaps.

Stallard, H. B. A new technique for the application of radon seeds to the sclera in the treatment of glioma retinae. *Brit. Jour. Ophth.*, 1938, v. 22, Oct., pp. 604-608.

The technique described varies from that of Foster Moore as used at St. Bartholomew's Hospital. The cases of two children in whom the glioma was adjacent to the optic disc on the temporal side are described. In each case no increased irritation, no infection, and no sepsis followed the procedure, and there was no evidence of damage to the optic-nerve head or to the ocular media. The method is said to be technically simple and to be effective and free from complications. The radon seeds are embedded in a strip of dental stent shaped to the sclera at the site, and secured in place by sutures traversing the superficial layers of the sclera in front of and behind the equator. (Figures, references.)

D. F. Harbridge.

16

INJURIES

Agnello, Francesco. Nasal syndrome and neuralgia of trigeminus through cornea injury. *Riv. Oto-Neuro-Oft.*, 1938, v. 15, Jan.-Feb., pp. 79-86.

A woman of forty years after a wound of the left cornea by her fingernail, became affected by intense pain around the corresponding orbit. The pain did not yield to the action of sedatives or hypnotics. The cornea showed

a linear wound whose character was not proportioned to the intensity of the other symptoms. A woman of 36 years was wounded on the left cornea by the fingernail of a baby. The same recurrent symptoms followed. In each the symptoms disappeared after treatment given to improve the general condition of the patient. M. Lombardo.

Alexandrov, V. V. The rationale of the set-up for the campaign against ocular traumatism. *Viestnik Opht.*, 1938, v. 12, pt. 2, p. 271.

A description of the official set-up of this department of ocular prophylaxis. Ray K. Daily.

Aliquò-Mazzei, Alessandro. Treatment of traumatic rupture of the sclera. *Boll. d'Ocul.*, 1938, v. 17, Feb., pp. 80-91.

Of four cases of indirect or contused rupture of the sclera, three were caused by the horn of an ox in farm workers. The fourth case was in a mechanic aged 19 years whose eye was struck by a fragment of a firearm. All four patients showed subconjunctival rupture near the limbus in the upper nasal segment of the globe, with subconjunctival dislocation of the lens. Conservative treatment is to be used, and enucleation or evisceration should not be resorted to sooner than a month after the injury. Surgical and prophylactic treatment are discussed. (Bibliography.)

Melchior Lombardo.

Avalos, Enrique. Electric ophthalmia as an industrial accident. *Rev. Cubana Oto-Neuro-Oft.*, 1938, v. 7, March-April, p. 41.

The effects upon the eye of electrical energy of varying intensities are described, and prophylactic measures suit-

able for workers exposed to such harmful effects are proposed.

Edward P. Burch.

Baltain, M. M. X-ray localization of intraocular foreign bodies. *Viestnik Opht.*, 1938, v. 16, pt. 1, p. 81.

A review of the various methods in use. The author prefers Comberg's method, in the use of which he replaces the contact glass by a prothesis of his own design. In doubtfully localized foreign bodies, he uses injection of radiopaque substances into Tenon's capsule. (Illustrations.)

Ray K. Daily.

Georgariou, P. M. Cholesterinosis bulbi. *Graefe's Arch.*, 1938, v. 139, pt. 1, pp. 32-49.

A girl 14 years old, who had been struck in the left eye with scissors ten years previously, had been totally blind for two years. The eyeball had recently shown much ciliary and conjunctival injection and a filling of the anterior chamber with a dense, white compact mass of rhombic cholesterine crystals. By paracentesis, these crystals were drawn off and their character confirmed. Thereafter the intraocular tension remained very low. Cholesterine crystals appeared again in the anterior chamber. This condition, to be distinguished from lipoidosis bulbi, is here described for the first time.

H. D. Lamb.

Gonçalves, Paiva. Penetrating orbital injury produced by fencing saber without lesion of skin or eyeball, and retention of metallic fragment in posterior cerebral fossa. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 1, pp. 237-248.

This trauma was sustained by an officer of the army, 29 years of age, during

a fencing lesson. The saber of his opponent entered the left orbital cavity through the conjunctiva, nasally to the eyeball, without injury to the globe itself. The injury was followed by slow pulse, vomiting, slight rise of temperature, severe headache, and semicoma. Locally there was marked chemosis of the eyelids, as well as subconjunctival hemorrhage more pronounced near the inner canthus. The eye was slightly deviated downward and outward. The fundus was normal. X ray showed to front view a foreign body which seemed to be located near the apex of the orbital cavity. The patient was operated upon under local anesthesia, an incision being made in the skin of the upper lid near the orbital margin, and over the nose. No foreign body was found, and the walls of the orbit appeared to be normal. A second X ray, showing a profile of the skull, revealed a foreign body located within the cranial cavity in the left occipital region. The cranial cavity was exposed by trephining a small flap of bone in the left occipital region, and a metallic foreign body 5 by 1 mm. was found near the opening and was easily removed. In a few months both eyes had normal motility as well as normal vision. Reconstruction of the path of the foreign body showed that the saber must have entered the left orbit through the conjunctiva near the inner canthus, penetrated the tendinous ring of Zinn, transversed the sphenoidal fissure, and passed through the whole cranial cavity to strike the occipital bone, where the point of the saber remained after the saber was withdrawn.

Ramon Castroviejo.

Grancini, L. E. Contribution to the study of ocular lesions from electric discharge, especially in relation to lens

changes. *Boll. d'Ocul.*, 1938, v. 17, Feb., pp. 92-111.

The face of a man of 45 years was swept by the flame developed from contact of an iron tool with a high tension wire. No shock was received. A few hours later his left cornea was slightly turbid, the iris hyperemic, the pupil slightly dilated and not reacting to light. The lens had a posterior capsular cataract and tension was 85 mm. (Schiötz.) Lens injury occurred in a man of 39 years, who on raising a hammer to within about 30 cm. of a high tension wire received a shock from which he remained unconscious for about six hours. The writer reviews experimental researches on electric cataract, and comes to the following conclusions: Electric cataract is the direct and immediate effect of the passage of the electric current through the lens. A co-existing uveal lesion favors formation of cataract. The cataract may reach maturity or the lens may remain partially transparent. (Bibliography.)

Melchior Lombardo.

Hertel, E. The closure of the wound by operation in perforating injuries of the cornea. *Graefe's Arch.*, 1938, v. 139, pt. 1, pp. 1-16.

The author agrees with Kuhnt that where there is a central, straight, perforating corneal wound with smooth sides and of an obliquity up to 3 mm., in the absence of conjunctivitis or tear-sac disease, no operative procedure is indicated. In the overwhelming majority of the author's cases, however, there was present a large wound with gaping and partly displaced wound edges and frequent prolapse of the iris. Operation was then necessary to close the wound and consisted of corneal suture or conjunctival flap, or both. In corneal suture, the thread does not pene-

trate the entire thickness of the cornea but only to the junction of its middle and posterior thirds. Nine illustrations taken from sections through healing corneal wounds, clearly show the approximation of the wound edges obtained by corneal suture or conjunctival flap. H. D. Lamb.

Kamel, Sabri. A case of traumatic total depigmentation of the iris. *Bull. Ophth. Soc. Egypt*, 1936, v. 29, p. 156.

A case is reported in which large patches of iris pigment were scattered over the lens capsule, together with hundreds of minute pigment granules. There was a superficial opacity of the lens. The iris meshes were entirely normal and the pupil showed no synechiae. The iris was tremulous and vision was reduced to hand movements. These changes occurred within 24 hours after injury. Edna M. Reynolds.

Lazarev, E. G. A new system of protective lenses for workers. *Viestnik Opht.*, 1938, v. 12, pt. 2, p. 269.

The author describes a new design which consists principally of stenopeic slits, placed horizontally in one eye and vertically in the other. (Illustrations.) Ray K. Daily.

Medvedev, H. I. So-called consensual ocular reactions. *Viestnik Opht.*, 1938, v. 12, pt. 3, p. 338.

This is a report of tonometric curves of both eyes in 46 cases of traumatism to one eye. The conclusions are that the primary reaction to traumatism may be either hypotension or hypertension, depending on the complications. There is a reflex effect on the uninjured eye, the extent and duration of which depends on the reaction of the diseased eye. The most marked feature of the reflex changes is the increased amplitude of

the daily tension curve. There may also be an effect on the adaptation, corneal sensitivity, angioscotomata, and accommodation. Ray K. Daily.

Rapisardo, Dante. A rare case of detachment of the pars iridica retinae. *Boll. d'Ocul.*, 1938, v. 17, Jan., pp. 40-44.

A man of 23 years who had sustained a perforating wound of the cornea at the age of nine years showed a dense adherent leucoma at the 5-o'clock position. Lens capsule was incarcerated, and there was posterior synechia with adhesion of the upper part of the iris to the lens capsule. The pupillary area was in great part occupied by a membrane of the same color as the pupil. This formation evidently consisted of posterior layers of the iris which had become adherent to the lens capsule and had been brought down and held in that position by the part of the capsule included in the corneal scar.

Melchiore Lombardo.

Sherman, G. C. Ocular injury with an indelible pencil. *Viestnik Opht.*, 1938, v. 12, pt. 2, p. 277.

A six-year-old girl came to the clinic six days after perforating the right eye with an indelible pencil, a particle of which remained in the eyeball. The aqueous, the lens capsule, and the iris had a violet tint, the fundus was invisible, and vision was counting of fingers close to the face. The anterior chamber was opened and was irrigated with 1 to 1000 tannic-acid solution, and two drops of 1 to 1000 collargol were introduced. A fibrinous iridocyclitis followed, and the result was a quiet eye with an opaque cornea, and vision equal to light perception. Ray K. Daily.

Vila Ortiz, J. M. Case of traumatic cataract in rosette. *Trabalhos do Prim-*

eiro Cong. Brasileiro de Opth., 1936, v. 1, pp. 249-251.

The author has already reported five such cases, in all of which he found a history of trauma. The present patient had sustained a severe blow on the head 25 years previously.

Ramon Castroviejo.

Wiegmann, E. A case of spontaneous reattachment of a traumatic iridodialysis. *Klin. M. f. Augenh.*, 1938, v. 101, Sept., p. 423.

In a laborer a small traumatic iridodialysis became spontaneously reattached, showing that in small dialyses an expectant treatment may be indicated.

C. Zimmermann.

Wölfflin, E. On the time relationship of the occurrence of lens opacities after radiation with various wave lengths. *Klin. M. f. Augenh.*, 1938, v. 101, Sept., p. 321.

The varying time of occurrence of lens opacities after radiation with various wave lengths is not a uniform process which can be explained on a purely physical basis. The action of infrared and ultraviolet is a direct damage by absorption. Injuries by roentgen and radium rays are probably caused indirectly through the nourishing organ, namely the ciliary body. Otherwise the long latent period would not be physiologically conceivable, nor would it be logical that the most posterior parts of the lens should first become opaque.

C. Zimmermann.

Woodruff, H. W. Spontaneous extrusion of an extraocular foreign body (shot) with recovery of vision. *Amer. Jour. Opth.*, 1938, v. 21, Sept., pp. 1028-1029.

17

SYSTEMIC DISEASES AND PARASITES

Andrade, Cesario de. Complexity of the cervical oculo-sympathetic syndrome. *Trabalhos do Primeiro Cong. Brasileiro de Opth.*, 1936, v. 1, pp. 361-366.

Mention is made of the different ocular symptoms that take place in affections of the cervical sympathetic. Three cases are reported: one in which after an alcohol injection of the phrenic nerve the patient developed a typical Horner syndrome; one of trauma to the cervical vertebrae, with a syndrome of the posterior cervical sympathetic, including marked myosis and enophthalmos; a third in a patient with a tumor of the throat causing irritation of the cervical sympathetic with exophthalmos and marked mydriasis.

Ramon Castroviejo.

Busacca, Archimede. Worms and other intestinal parasites as cause of ocular affections, particularly uveitis. *Trabalhos do Primeiro Cong. Brasileiro de Opth.*, 1936, v. 1, pp. 289-290.

Intestinal parasites may produce a number of ocular manifestations, namely blepharitis, keratitis, conjunctivitis, uveitis, retrobulbar neuritis, and papillitis. Elimination of the parasites invariably cures the ocular manifestations.

Ramon Castroviejo.

Chojnacki, P. Experimental and clinical studies on focal infection of dental origin. *Graefe's Arch.*, 1938, v. 139, pt. 2, pp. 288-300.

In ten cases of iritis and four of axial optic neuritis (two bilateral), one or more teeth with dead pulp were extracted. Cultures from the apices of the affected teeth showed in nine cases streptococcus viridans and in four cases

forms of streptococci other than viridans and hemolyticus. From 24-hour-old primary bouillon cultures in each case, intravenous injections were made into either two or four rabbits. Some degree of ocular infection followed in 24 rabbits and streptococci were isolated from the blood of 21 rabbits out of 37 inoculated. From an experience of over 25 cases of ocular disease due to dental infection, the author concluded that negative roentgen-ray findings in the teeth were not decisive and that a dead tooth root without a granuloma was much more dangerous than one with a granuloma. H. D. Lamb.

Dejean, C. Fundus changes in the rabbit in rabies. *Bull. Soc. Franç. d'Opht.*, 1937, v. 50, pp. 247-154.

Twenty rabbits were inoculated with rabies through a trephine hole in the skull. Phenomena observed were: loss of corneal reflexes and pupil reactions to light; paralysis of the lid muscles, and of the external muscles of the globe; loss of transparency of the cornea and vitreous; intense congestion of the optic nerve and of the retina. The retina offers a true picture of the intracranial changes in rabies.

Clarence W. Rainey.

Eissa, A. S., and Kamel, Sabri. Three cases of tuberculosis of the eye. *Bull. Ophth., Soc. Egypt*, 1936, v. 29, p. 188.

The first case reported is one of primary tuberculous conjunctivitis and dacryoadenitis in a girl of seventeen years, which improved under general treatment. The second case is one of conglomerate tuberculous choroiditis which perforated the sclera near the limbus. The patient, aged five years, was found to be entirely free from tuberculosis elsewhere. The third case

is one of cold abscess of the globe in a child of five years, who had pulmonary tuberculosis and died shortly after excision of the globe.

Edna M. Reynolds.

Gabriélidés, C. A. Filaria in the anterior chamber of the eye. *Ann.d'Ocul.*, 1938, v. 175, Aug., pp. 581-589.

Report of one case of filaria in the anterior chamber. Instillation of pilocarpine in an attempt to lock the parasite in front of the iris seemed to irritate it, and the organism was lost behind the pupil. Enucleation was then performed and the parasite identified as a filaria.

John M. McLean.

Hermans. The pathology of ocular affections of dental origin. *Bull. Soc. Franç. d'Opht.*, 1937, v. 50, p. 155.

The reports of Fromaget, 1924, and Worms and Bercher, 1925, are reviewed. The author gives a detailed theoretical discussion of the manner in which various dental abnormalities and infections may cause ocular disease.

Clarence W. Rainey.

Klivanskaja, A. A. The eye as an indicator of congenital and acquired changes in children. *Viestnik Opht.*, 1938, v. 12, pt. 1, p. 116.

The author describes in detail the ocular symptoms of congenital syphilis, and hopes that very complete routine physical examinations of children will serve to detect, and to institute early treatment of, this disease.

Ray K. Daily.

Kreibig, W. Blood diseases and the eye. *Wien. med. Woch.*, 1938, July 11, p. 772.

Kreibig describes the eye findings in various diseases of the blood-forming organs, including the anemias, throm-

bosis, acute hemorrhage, leukemias, polycythemia, and agranulocytosis.

Theodore M. Shapira.

Meyer, F. W. Contribution to the syphilitic diseases of the eye. *Klin. M. f. Augenh.*, 1938, v. 101, Sept., p. 390.

A woman of 39 years was sent to a sanatorium with the diagnosis of right-sided scleritis and tuberculous keratitis. After a transfusion, she died suddenly from a thrombus in the carotid, which was mobilized by the transfusion and so induced embolism of the middle meningeal artery and cerebral hemorrhage. The autopsy revealed syphilitic mesaortitis and almost complete obstruction of the carotids, in connection with the roentgenological pulmonary findings, attributed to a luetic infection of about 10 or 15 years previously. But, the scleritis spoke for tuberculosis. The histologic changes in the eye are described in detail. The case shows the importance of seroreactions to lues, even in the presence of apparent ocular tuberculosis. C. Zimmermann.

Rosenblum, M. E. Our latest cases of cysticercus. *Viestnik Opht.*, 1938, v. 12, pt. 3, p. 349.

Brief case reports of thirteen cases treated during the last five years. Of these eight were subretinal, two pre-retinal, and three in the vitreous. In three of the subretinal cases the cyst was in the region of the macula. General examinations were made in nine patients; tenia solium was found in four, and eosinophilia in six cases. Localization was by the method of Gonin, verified by electrocoagulation under ophthalmoscopic control. All cases were operated upon; in eleven the cysticercus was extracted, and in two the attempt failed. Ray K. Daily.

Safar, K. Diabetes and the eye. *Wien. med. Woch.*, 1938, June 18, p. 685.

Safar discusses the various disturbances and changes that take place in the eye in diabetes. He states that symptoms are due only partly to disturbance in metabolism, blood-vessel changes also playing a part.

Theodore M. Shapira.

Schartz, S. E. Carbon-monoxide poisoning. *Viestnik Opht.*, 1938, v. 16, pt. 3, p. 370.

The symptoms of carbon-monoxide poisoning are very bizarre generally as well as relative to ocular manifestations. The author's case was unusually severe, with edema and ecchymosis of the lids, chemosis, exophthalmos, limitation of movement, superficial keratitis, and rise of intraocular tension. The final result was loss of vision in the right eye and recovery in the left.

Ray K. Daily.

Simoes, Elyseo. Heredity in ophthalmology. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 1, pp. 385-401.

After a long discussion on hereditary factors which play a role in ocular manifestations, the author reports six observations. The first is of a family of eight members, all having cataract. The second is of a small family in which there were four cases of infantile glaucoma. Consanguinity was found in the second instance. In the third family, of five persons, all had dyschromatopsia. In the fourth family, of 28 members in three generations, eight cases of albinism were observed. In the fifth family, 32 persons of three generations, there were twelve cases of albinism, and a history of consanguinity. The sixth family was of five persons in

which both parents and children were affected with myopia. The author concludes that there is a definite influence of heredity in ocular affections, consanguinity playing an important part in many cases. (63 references.)

Ramon Castroviejo.

Walker, J. R., and Walker, B. F. A specific treatment for herpes zoster. *Arch. of Ophth.*, 1938, v. 20, Aug., pp. 304-306.

The authors report that diphtheria antitoxin has proved to be a specific remedy for herpes zoster in the acute as well as in the chronic stage, usually giving relief from pain within 24 hours and preventing recurrences.

J. Hewitt Judd.

Weckert, Fritz. *Biology in ophthalmology*. Graefe's *Arch.*, 1938, v. 139, pt. 2, pp. 280-287.

A tuberculous inflammation of the retina or choroid resulting from bacillary emboli derived from the lymph glands at the hilus of the lung is an attempt with renewed energy to restore the normal state. Tuberculous and luetic infections of retina, uvea, and cornea correspond to similar infections of the cutis and the subcutaneous tissue of the skin.

H. D. Lamb.

Zobel. The treatment of headache and neuralgia by the oculist. *Zeit. f. Augenh.*, 1938, v. 95, June, p. 137.

The oculist need not send a patient away after prescribing glasses and determining that there is no cause for headache manifest in the fundus. Most headaches have their origin in a neuralgia of the trigeminal nerve. If pressure over the superior orbital margin causes pain or if the swollen nerve is palpable, the diagnosis of supraorbital neuralgia is certain. The author's

treatment consists of application of a galvanic current of two milliamperes for five minutes to each branch of the nerve. For supraorbital neuralgia the cathode is placed on the inner end of the superior orbital margin, the anode on the neck. A metallic taste confirms the passage of current through the nerve. Five daily sessions usually cure the patient completely.

F. Herbert Haessler.

Zolotnitskii, I. H. Malarial ocular complications in the Kiev region during the summer of 1935. *Viestnik Opht.*, 1938, v. 12, pt. 3, p. 377.

There were 68 cases classified as follows: keratitis herpetica 35, parenchymatous keratitis 2, herpes palpebralis 4, retinal hemorrhage 3, iritis 2, optic atrophy 1, dendritic keratitis 11, episcleritis 1, cyclitis 3, optic neuritis 1, convergent strabismus 1, vitreous opacities 4. The author urges that malaria be thought of in cases of obscure etiology, and that the melano-flocculation reaction be used in cases negative for the plasmodium. Ray K. Daily.

18

HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Allen, T. D. The value of routine in examinations of the eye. *Amer. Jour. Ophth.*, 1938, v. 21, Oct., pp. 1147-1152.

Bartels, Martin. Schools for individuals with defective vision. *Klin. M. f. Augenh.*, 1938, v. 101, Aug., p. 161.

Examination of inmates of blind asylums revealed quite a number of children who were not blind but only had defective vision. The author was instrumental in the foundation of schools for children with defective vision. He shows the possibility of educating such children to useful callings, discusses the

equipment and instruction in these schools, and advocates an international system. C. Zimmermann.

Davis, W. T. High lights of the history of ophthalmology. *Southern Med. Jour.*, 1938, June, p. 685.

This is an account of the development of ophthalmology from the time of the Code of Hammurabi to the present. John C. Long.

Esser, A. A. M. Old Indian ophthalmology. *Klin. M. f. Augenh.*, 1938, v. 101, Aug., p. 263.

A historical essay.

Grolman, Gunther von. The international prophylaxis of trachoma in our country (Argentina). *Arch de Oft. de Buenos Aires*, 1938, v. 13, March, p. 129; also *Rev. Oto-Neuro-Oft.*, 1938, v. 13, April, p. xxvii.

This article deals with regulations and problems regarding the inspection of immigrants to the Argentine for the purpose of excluding those suffering from trachoma. The chief difficulty is in arriving at a satisfactory and fair decision as to which individuals afflicted with trachoma grade 4 are capable of transmitting the disease.

Edward P. Burch.

Hitz, J. B. An evaluation of visual-testing methods in schools. *Amer. Jour. Ophth.*, 1938, v. 21, Sept., pp. 1024-1027.

Laskin, B. H. Sanitary education in the campaign against ocular traumatism. *Viestnik Opht.*, 1938, v. 12, pt. 1, p. 122.

An outline of lectures on ocular sanitation, for groups of workers in industrial establishments. Ray K. Daily.

Leydhecker, F. K. Concerning the eye, from Rückert's "Wisdom of the

Brahmans." *Klin. M. f. Augenh.*, 1938, v. 101, Aug., p. 271.

Quotations from a didactic poem on personal and general questions of life. C. Zimmermann.

MacCallan, A. F. The world-wide distribution of trachoma, excluding the Dominions, Colonies, and mandated territories of Great Britain. *Brit. Jour. Ophth.*, 1938, v. 22, Sept., pp. 513-541.

It is the purpose of the author in this lengthy presentation to give an approximate estimate of trachomatization throughout the world, exceptions being noted which have been previously outlined (see *Amer. Jour. Ophth.*, 1935, v. 18, March, p. 301). The use of the slitlamp not being possible in distant sections of the world, there must of necessity be an underestimate of trachoma actually existing in such regions. The article does not lend itself to abstract. D. F. Harbridge.

Mendoza, Rafael. The oculist and industrial accidents. *Rev. Cubana de Oto-Neuro-Oft.*, 1938, v. 7, March-April, p. 49.

The author cites some of the difficulties encountered in industrial ophthalmology. Edward P. Burch.

Meyerhof, Max. The history of trachoma treatment in antiquity and during the Arabic middle ages. *Bull. Ophth. Soc. Egypt*, 1936, v. 29, p. 26.

The Greek medical works which have come down to us show a knowledge of four stages of trachoma, of entropion and trichiasis but not of pannus. The Greeks knew different scraping manipulations not much inferior to those in use at present. As a treatment for trichiasis they excised the skin but not the tarsus, and made an intermarginal incision with transposition of the lashes.

The Arabs knew the connection of trichiasis and pannus with trachoma, and appreciated its contagious character. Their mechanical and operative treatment of trachoma was not very different from our own. The best description of trachoma and its treatment before the 19th century was written by Ali ibn Isa, an oculist of Bagdad in the tenth century. Edna M. Reynolds.

Schwichtenberg, A. H. The evaluation of orthoptic training for aviators. *Amer. Jour. Ophth.*, 1938, v. 21, Sept., pp. 980-990.

Sena, J. A. Some notes on the International Congress of Ophthalmology. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, March, p. 135.

The author discourses briefly upon the ocular disorders, chiefly trachoma, encountered in Egypt, giving a brief account of the ophthalmic hospital facilities. He also gives a résumé of the meeting of the International Organization Against Trachoma.

Edward P. Burch.

Vila Ortiz. Instruction and professional orientation of the visually defective. Creation of special schools. *Arch.*

de Oft. de Buenos Aires, 1935, v. 13, Feb., p. 71.

The author makes a plea for the establishment of schools for the visually handicapped in the Argentine. He believes that children whose vision is 2/10 or less in the better eye with or without correction would be greatly benefited by the establishment of such schools. The selection of students and instructors, and the method and conditions of instruction are outlined in some detail.

Edward P. Burch.

19

ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

Fortin, E. P. The foveal mosaic. *Arch. de Oft. de Buenos Aires*, 1938, v. 19, Feb., p. 51.

The author feels that our knowledge of the structure of the fovea based on histologic studies should be modified in the light of entoptic observations. He believes that in the foveal region there are specialized cones concerned chiefly with ocular fixation. These are 75 microns long and 2 in diameter and bear no resemblance to ordinary cones. (Illustrations.) Edward P. Burch.

NEWS ITEMS

Edited by DR. H. ROMMEL HILDRETH
640 S. Kingshighway, Saint Louis

News items should reach the Editor by the twelfth of the month

DEATHS

Dr. Alfred F. VanHorn, Plainfield, New Jersey, died September 30, 1938, aged 77 years.

Dr. Harry S. Hughes, Saint Louis, Missouri, died September 15, 1938, aged 56 years.

Dr. Anders G. Hovde, Los Angeles, California, died October 14, 1938, aged 62 years.

Dr. Frank Clifford Ard, Westfield, New York, died August 23, 1938, aged 74 years.

Dr. Allen Rupert Cunningham, Halifax, Nova Scotia, Canada, died July 3, 1938, aged 50 years.

Dr. Harry Sebastian Reger, Jamestown, New York, died July 14, 1938, aged 60 years.

MISCELLANEOUS

The American Board of Ophthalmology announces an important change in its method of examination of candidates for the Board's certificate. Written examinations will be held in various cities two months prior to the date of the oral examination. The first written examination will be on March 15, 1939. For further particulars see the editorial on page 85 of this issue of the American Journal of Ophthalmology.

Examinations will be divided into two parts. Candidates whose applications are accepted will be required to pass a written examination which will be held simultaneously in various cities throughout the country approximately 60 days prior to the date of the oral examination.

The written examination will include all of the subjects previously covered by the practical and oral examinations.

Oral examinations will be held at the time and place of the meeting of the American Medical Association and of the American Academy of Ophthalmology and Otolaryngology, and occasionally in connection with other important medical meetings. The oral examination will be on the following subjects: External diseases, Ophthalmoscopy, Pathology, Refraction, Ocular motility, Practical surgery.

Only those candidates who pass the written examination and who have presented satisfactory case reports will be permitted to appear for the oral examination.

Examinations scheduled for 1939. Written: March 15th and August 5th. Oral: Saint Louis, May 15th; Chicago, October 6th.

Applications for permission to take the written examination March 15th must be filed with the Secretary not later than February 15th.

Application forms and detailed information should be secured at once from Dr. John Green, Secretary, 6830 Waterman Avenue, Saint Louis, Missouri.

The University of Buffalo awards annually a gold medal for a work on an ophthalmologic subject. Recent awards went to Dr. J. Bellows of Chicago, Dr. Joseph Globus of New York, and Dr. J. Evans of Brooklyn. For details write to Dr. H. W. Cowper, 543 Franklin Street, Buffalo, New York.

A quarterly journal, The Journal of Social Ophthalmology, is now being published by the International Association for the Prevention of Blindness, with articles appearing in English and French. The address of the American office is 50 West 50th Street, New York City, with Lewis H. Carris the American correspondent.

The following new members were elected to fill vacancies on the Board of Directors of the National Society for the Prevention of Blindness, at the annual meeting of the Society, December 1, 1938: Dr. Thomas Johnson, ophthalmologist, New York City; Dr. John L. Rice, Health Commissioner of New York City; Professor Ira V. Hiscock, of New Haven, Connecticut, President of the National Health Council and Professor of Public Health at Yale University; Reverend John Gass, D.D., Rector of the Church of the Incarnation, New York City; Mrs. Hazel C. McIntire, of Columbus, Ohio, Director of Special Classes for the Visually Handicapped, Ohio State Department of Education. The following members of the Board of Directors were reelected for a three-year period at the annual meeting: Dr. A. J. Chesley, St. Paul, Minnesota; Mr. George C. Clark, New York City; Dr. J. Clifton Edgar, Greenwich, Connecticut; Dr. Edward Jackson, Denver, Colorado; Dr. Albert B. Meredith, Cranford, New Jersey; Mr. Preston S. Millar, New York City; The Rev. Alphonse M. Schwitalla, Saint Louis, Missouri; Dr. William Zentmayer, Philadelphia, Pennsylvania.

Portland, Oregon, is to have a Medical Library Building. In Science (issue of November 25, 1938) we notice that Dr. John E. Weeks has given \$100,000.00 to the University of Oregon Medical School. To this has been added an equal amount by the Rockefeller Foundation

and a sum secured from the Public Works Administration. These make a total of \$363,350.00, to construct a building for the Medical Library, with an auditorium to seat 600 for student and professional gatherings.

Harvard Medical School offers the following courses in Ophthalmology for the first half of 1939:

February 6-18. Ocular Muscles. This course includes neuro-anatomy and physiology of ocular muscles as an introduction to didactic and clinical work. It deals extensively with vertical deviations. Orthoptics not included. This course is given by Drs. Bielschowsky and Casten.

March 1-31. A course on The use of the slitlamp will be given by Dr. Betham; a course on External diseases of the eye by Dr. Gundersen; and a course on Ocular complications in general disease by Dr. King. These courses may be taken simultaneously.

April 10-May 6. Recent Advances in Ophthalmology. This course correlates pathology of the eye and clinical practice. It draws on all resources of the Eye Department of the Massachusetts Eye and Ear Infirmary; clinical, laboratory, and research. Although this course has pathology as a basis, it gives a cross-section of all work at the Infirmary. The pathology is given by Dr. Terry.

July. Visual Optics and physiology. This course is given by Drs. Ludvigh, Cogan, and Easton.

Beginners and general practitioners may take the course in Ocular complications in general diseases. All other courses listed are not open to beginners. Further information may be obtained from the Assistant Dean of the Medical School.

SOCIETIES

The Eye Section of the Philadelphia County Medical Society met on December 1, 1938. Dr. Aaron Brav presented Trachomatous ulcera-

tion of the cornea, treated with prontosisil. Dr. Temple Fay presented a moving-picture demonstration, in colors, Visual fields and other findings, including details of operation, and postoperative recovery of brain tumor. Dr. Walter I. Lillie discussed Dr. Fay's presentation.

The Canadian Ophthalmological Society, as newly instituted, held its first meeting in Montreal on August 24-25, 1938. The first president of the Society is Dr. Gordon Byers.

PERSONALS

Dr. Daniel B. Kirby, surgeon, and Dr. A. Egerhoffer, senior resident at the Institute of Ophthalmology of the Presbyterian Hospital in New York, journeyed to Santa Fe, New Mexico, to operate on a number of patients with eye diseases at the Procter Memorial Eye Clinic, cooperating with Dr. W. C. Barton of Santa Fe. The operations included a great number of cataract, glaucoma, strabismus, and pterygia cases. The clinic was conducted through the month of August, 1938.

Dr. William R. Fringer announces that his son, Dr. Robert C. Fringer, is now associated with him in the practice of ophthalmology, William Brown Building, Rockford, Illinois.

Dr. C. W. Rutherford, Indianapolis, was the guest speaker at the meeting in Toledo, Ohio, Eye, Ear, Nose, and Throat Club the evening of November 17th.

Dr. William Thornwall Davis, Professor of Ophthalmology, George Washington University School of Medicine, Washington, D.C., has been invited to participate in the Continuation Study Course at the University of Minnesota on January 16, 1939. Dr. Davis will lecture on Vertical muscle imbalance in its relation to convergent squint, and the Choice of procedure in muscle surgery.

HISTOLOGICAL STUDY OF THE EYES OF RABBITS CONGENITALLY INFECTED WITH SYPHILIS*

HIDETOSHI SHIGA, M.D.

Tokio, Japan

Up to the present time, animal experiments on syphilis of the eye have been chiefly limited to acquired syphilis. In view of the large rôle that congenital syphilis plays in the field of ocular disease also, I determined to conduct investigations in this field through rabbit eyes congenitally infected with syphilis.

Syphilis was induced by the method of Professor Takaki¹ as follows: Syphilitic material was inserted under the skin in the nose of female rabbits so deeply as to touch the bone, the skin was then sutured, and, after a few days when the wound was nearly healed, it was tapped gently every day so as to develop the lesion gradually. When the rabbits were thoroughly infected with syphilis they were mated. During the course of resulting pregnancy, 10 c.c. of syphilitic emulsion was, in a number of cases, injected intravenously through the aural vein, in order to secure a heavier infection.

Pregnancy in the normal rabbit lasts from 28 to 30 days, the number of young in a litter being 5 or 6, having a body weight of about 50 grams each at birth, increasing in two months to about 1,000 grams. In the case of our infected rabbits, however, the circumstances were very different. Abortion and premature birth, with deformity and dropsy of the fetus, were frequent. The general de-

velopment of the fetus was often deficient, and there was great variation in the size and weight of the individual fetuses in a litter. Even when the pregnancy carried through to full term the young often died soon after birth.

In some cases the fetus was extracted from the uterus at mid term so that the eyes could be examined. When this was done, the livers of the premature fetuses were taken out, and with the livers of those rabbits which died soon after birth, were emulsified and injected into the testicle of normal rabbits. A syphilitic lesion resulted in each case; that is to say, a tumor formation developed that was found on examination to contain spirochetæ.

The apparently healthy young were brought up under observation, but sometimes showed eye lesions. In such cases their eyes were removed and fixed in 10-percent formalin. This was also done with the eyes of all the premature fetuses and of the rabbits that died soon after birth. In the latter instances the eyes were removed with the neighboring organs, including lids, because the upper and lower lids adhered closely together.

My experimental material, including control fetuses and young from normal rabbits, is shown in table 1.

Histological study was carried out with

* From the Public Health Center. The author wishes to extend acknowledgement for the cordial guidance throughout the work rendered by his leader Prof. Dr. I. Takaki, of Tokio Imperial University.

TABLE 1
DATA ON EXPERIMENTAL MATERIAL

No. of syphilitic mother rabbit	15	51	11	48	22	C	12	20	21	C	C	43	*22	5	*5	*5	C	*5	*22	78	*78	177	*177	30	25	*78	13	To-tal
Age (days) when the young were dead or material was removed		-13	-9	-4	-3	-3	0	0	0	0	0	+3	+7	+9	+11	+13	+13	+19	+22	+33	+43	+56	+59	+60	+61	+62	+93	
Birth	E	E	E	P	P	P	S	S	S	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	
Number of fetuses or young examined	5	7	7	5	4	6	9	5	2	5	5	4	3	1	6	2	1	3	1	1	1	1	1	1	1	1	1	88

C = Control. E = Extraction. P = Premature birth. S = Still birth at full term. N = Normal birth.

- signifies days earlier than the expected pregnancy period.

* signifies the same mother rabbit whose number is given on the left, but the age of the young is different.

paraffin or celloidin sections of the eyeball, the sections being taken, in general, vertical to the natural position, but in some cases horizontally and in others tangential to the cornea. In the case of rabbits more than one month old, the section was made of the anterior half of the eyeball. Preparations were usually stained with hematoxylin and eosin, but when necessary Van Gieson's, or Unna-Pappenheim's, or bacterial staining was used. Spirochaetae pallida were examined with Jahnke's modified method of Levaditi's silver staining.

The larger eyes after being fixed in formalin were, in general, divided into two parts on a meridional plane, one for hematoxylin-and-eosin staining and the other for Jahnke's staining. Since the eyes of the fetuses were too small to be divided without injuring ocular tissues, the right and left eyes were used separately for these two types of staining.

The results of examination are shown in tables 2, 3, and 4.

The following is a summary and discussion of these results according to the three groups into which all cases have been classified.

I. Extracted fetus, premature fetus, and dead fetus at full term (tables 2 and 3).

The eyes of tiny fetuses extracted by laparotomy showed no particular pathological change and no spirochaetae could be seen in the eye nor in its neighboring tissues (table 2).

In the case of the eyes of premature fetuses and dead fetuses at full term, hemorrhage and retardation of development were frequent. Hyperemia and hemorrhage were often present in subcutaneous tissues of lids, extrinsic ocular muscles, neighboring tissues of lacrimal glands, conjunctiva, subconjunctival tissue, and in the cornea (fig. 1). Edema

TABLE 2
OCULAR CHANGES IN CONGENITAL SYPHILIS IN THE RABBIT

Group		I	II	III
No. of syphilitic mother rabbit		No. 15	No. 51	No. 11
Reinoculation		+	+	—
Age of fetus (days)		—13	—9	—4
Number of fetuses examined		5	7	7
Histological findings	Outer coat	Corneosclerotic coat is not yet developed. Lids are not formed.	Cornea and sclerotic separate from the surrounding tissues. Lids are developed but distinction between upper and lower lids is not formed.	Cornea and sclerotic are formed. Cornea is thin and young big nuclei in it are stained faintly. Karyokinetic figures can be seen. Upper and lower lids are formed but both lids adhere closely together.
	Intermediate coat	Uvea is not differentiated. At the layer where choroid will be developed later, capillary vessels can be seen filled with erythroblasts. Iris and ciliary body are not differentiated.	Uvea is differentiated. Layer of capillary vessels in choroid is formed, with erythrocytes.	Layers in uvea are differentiated.
	Inner coat	Outer nuclear layer in the retina is very thick. Posterior pole of lens is nearly attached to it. Capillary vessels in the retina and the vitreous are few.	Outer nuclear layer of the retina is still thick. Capillary vessels are formed in the retina and the vitreous.	Differentiation develops.
Pathological changes		—	—	In one case hyperemia and hemorrhage are seen in the subcutaneous tissue of lids and in the neighborhood of lacrimal glands. A few leucocytes in the subcutaneous tissues of lids and tarsal conjunctiva.
Spirochaetae		—	—	—

was sometimes seen in the subcutaneous tissues of the lids.

The tissues were much more delicate than those of the normal rabbit controls at a corresponding age.

Spirochaetae were found in three cases in the cornea or in the sclerotic (fig. 2), or in both the cornea and the sclerotic.

Cell infiltration was seldom found in the fetus. Changes in the corneal corpuscles, such as slight swelling and proliferation, are difficult to determine in the foetus, because the corneal corpuscles in the foetus are large and numerous in comparison with those in the adult, and no such changes were recognized, although care-

TABLE 3
OCULAR CHANGES IN CONGENITAL SYPHILIS IN THE RABBIT

Group	IV				V		VI						VIII			IX	
No. of syphilitic mother rabbit	No. 22				No. 48		No. 12						No. 20			No. 21	
Reinoculation	+				+		+						-			-	
Age of fetus or young (days)	-3				-4		-3						0			0	
No. of young	No. 6	No. 7	No. 8	No. 9	No. 3	No. 5	No. 501	No. 503	No. 505	No. 506	No. 507	No. 508	No. 1	No. 4	No. 5	No. 1	No. 1
Edema		Subcutaneous tissue of lids.					Subcutaneous tissue of lids.		Subcutaneous tissue of lids.	Subcutaneous tissue of lids.	Subcutaneous tissue of lids.				Subcutaneous tissue of lids.	Subcutaneous tissue of lids.	Subcutaneous tissue of lids.
Hypertrophy	Subcutaneous tissue of lids. At the foot of nictitating membrane. Subconjunctival tissue. Near optic nerve.	Subcutaneous tissue of lids. Near lacrimal gland.	Subcutaneous tissue of lids.	Subcutaneous tissue of lids.		Subcutaneous tissue of lids.	Subcutaneous tissue of lids. Fornical conjunctiva. Uvea.	Subcutaneous tissue of lids. Fornical conjunctiva. Tarsal conjunctiva.	Subcutaneous tissue of lids. Fornical conjunctiva. Tarsal conjunctiva.	Subcutaneous tissue of lids. Fornical conjunctiva. Tarsal conjunctiva. Limbus.	Subcutaneous tissue of lids.	Subcutaneous tissue of lids.	Subcutaneous tissue of lids. Tarsal conjunctiva. Inner layer of bulbar conjunctiva. Uvea. Retina. Extrinsic ocular muscles.		Subcutaneous tissue of lids.	Subcutaneous tissue of lids.	Subcutaneous tissue of lids.
Hemorrhage								Subcutaneous tissue of lids. Subconjunctival tissue of palpebrae.		Subcutaneous tissue of lids. Fornical conjunctiva. Tarsal conjunctiva. Limbus.	Subcutaneous tissue of lids.				Subcutaneous tissue of lids.		
Round-cell infiltration													Extrinsic ocular muscles.				
Remarks								Retardation of development. markable.						Retardation of development.		Retardation of development.	Spirochaetae in the liver.
Spirochaetae (in the eye)	+	Not examined.	Not examined.	+	-	-	-	-	-	-	-	-	-	-	+	-	-

Pathological changes

TABLE 3—Continued
OCULAR CHANGES IN CONGENITAL SYPHILIS IN THE RABBIT

Group	X		IV		XI								XIII	XV	
No. of syphilitic mother rabbit	No. 43		No. 22		No. 5								No. 78	No. 177	
Reinoculation	+		-		-								-	-	
Age of fetus or young (days)	+7		+9		+13								+22	+59	
No. of young	No. 1	No. 2	No. 11	No. 12	No. 1	No. 11	No. 12	No. 13	No. 14	No. 15	No. 16	No. 2	No. 3	No. 19	No. 1 (Left eye)
Edema															
Hyperemia															
Hemorrhage	Extrinsic ocular muscles.	Ciliary body.			Ciliary body.							Ciliary body.	Ciliary body.		
Round-cell infiltration.	Extrinsic ocular muscles (also leucocytes). Limbus.	Limbus.	Limbus.	Limbus.	Limbus. Sclerotic. Ciliary body. Extra-ocular muscles.	Limbus (slightly).	Limbus (slightly).	Limbus (slightly).	Limbus (slightly).	Limbus (slightly).	Limbus (slightly).	Limbus. Sclerotic. Ciliary body. Extra-ocular muscles.	Limbus. Sclerotic. Ciliary body. Extra-ocular muscles.	Limbus. Sclerotic (also leucocyte).	Limbus. Sclerotic (also leucocyte).
Remarks					Changes of corneal corpuscles.							Changes of corneal corpuscles.	Changes of corneal corpuscles.		
Spirochaetae (in the eye).	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-

Pathological changes

TABLE 4
OCULAR CHANGES IN CONGENITAL SYPHILIS IN THE RABBIT

Group	XIII	XV
No. of syphilitic mother rabbit	No. 78	No. 177
Reinoculation	—	—
Age (days)	62	56
No. of young	No. 3 (left eye)	No. 1 (right eye)
Clinical condition	Ulceration nearly in the center of the cornea and in the lower limbus. Ciliary injection. Purulent discharge. Edematous iris. Relief indistinct.	Thick corneal opacity from the upper limbus extending downwards and covering nearly $\frac{2}{3}$ area of the whole surface. Purulent discharge. Edematous iris. Relief indistinct.
Epithelium of the cornea	Just in the central part of the corneal swelling and proliferation of cells. Infiltration of pseudo-eosinophilic leucocytes. Otherwise degeneration of the epithelium.	Defect of the epithelium in wide area corresponding to corneal ulcer. Infiltration of pseudo-eosinophilic leucocytes.
Substantia propria	Subepithelial abscess. Infiltration of pseudo-eosinophilic leucocytes is remarkable especially in the anterior layer. Swelling and proliferation of corneal corpuscles. Leucocytes and cellular debris between laminae.	Infiltration with pseudo-eosinophilic leucocytes in the anterior layer. Also diffuse infiltration in the whole layer. Subepithelial change is remarkable. Spirochaetae were found. Swelling and proliferation of corneal corpuscles.
Descemet's membrane	Normal	Normal
Endothelium	Subendothelial (in the corneal parenchyma) infiltration of pseudo-eosinophilic leucocytes.	Normal
Limbus corneae	Infiltration of pseudo-eosinophilic leucocytes and round cells. Hyperemia.	Upper limbus: Edema, hyperemia. Hemorrhage. Prominent infiltration of pseudo-eosinophilic leucocytes. Lower limbus: Perivascular round-cell infiltration. Subepithelial vascularization.
Sclerotic	No remarkable change.	In the inner layer of limbus vascularization with perivascular round-cell infiltration.
Iris and ciliary body	At the foot of the iris and ciliary body: infiltration of pseudo-eosinophilic leucocytes. Iris: dilatation of capillary vessels.	Infiltration of pseudo-eosinophilic leucocytes. Hemorrhage at the foot of the iris and in the ciliary body.
Change of blood vessels	No remarkable change.	Thickening of walls of capillary vessels. Perivascular round-cell infiltration at limbus.
Remarks	Exudation at the angle of the anterior chamber.	Spirochaetae in the liver.
Spirochaetae	—	+

ful comparison was made with the control. No changes of any kind were seen in the blood vessels.

II. Young born at full term (tables 3 and 4).

The eyes of the young which died a few days after birth showed inflammatory changes, and the development was below normal both in the eyes and in general body development.

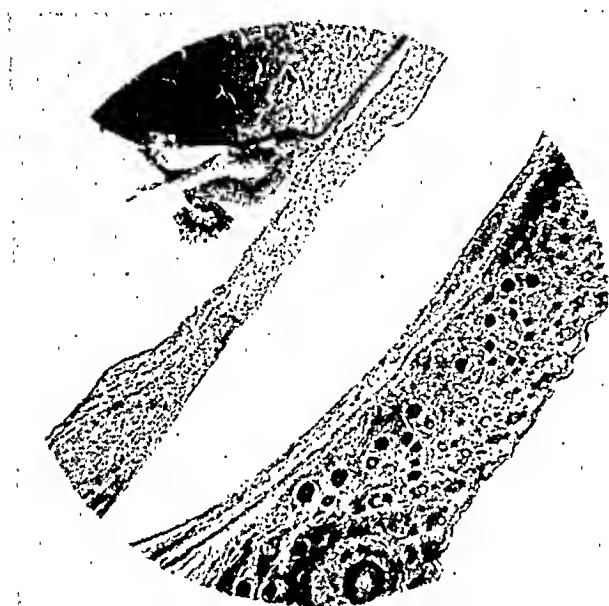


Fig. 1 (Shiga). Showing hemorrhage in the subcutaneous tissue of the lid, conjunctiva, subconjunctival tissue, and at the margin of the cornea; also the deficient development of several tissues in the eye of fetus no. 506 from syphilitic mother rabbit no. 12.

The usual body weight of the newborn young is about 50 grams, each member of a litter being nearly the same size. In two months they weigh 1 kg. In contrast to this, body weight of young no. 1 from the syphilitic mother rabbit no. 177 attained only 310 grams in 56 days.

Histological changes were frequent. In nearly all cases in this category there was diffuse infiltration of round cells in the limbus, and in those in groups X, XI, XIII, and XV infiltration was found also in one or more of the following—the

sclerotic, ciliary body, extrinsic ocular muscles, and iris. Infiltration of pseudo-eosinophilic leucocytes also was sometimes seen.

There were no changes in the blood vessels, such as thickening of the vessel wall, obliteration, or vascularization. In most rabbits of group XI perivascular infiltration was seen in the limbus, but it was not very remarkable.

There were two cases of prominent



Fig. 2 (Shiga). Demonstrating a spirochaeta in the sclerotic of fetus no. 9 from syphilitic mother rabbit no. 22.

keratitis which are described in full detail below (III).

The corneal corpuscles showed no significant change except in two cases in which proliferation and tumefaction were found. Granules faintly stained by hematoxylin were seen in the shape of a spindle or in a tiny lump between laminae of the substantia propria or around corneal corpuscles.

Spirochaetae were found in four cases out of 28 in this group although their presence did not always coincide with histo-

pathological changes as has been claimed by v. Hippel,² Clausen,³ Cattaneo,⁴ Schlimpert,⁵ Bab,⁶ and Waetzold.⁷

III. Cases of corneal ulcer (table 4).

(A) Young no. 3 from syphilitic mother rabbit no. 78 (group XIII).

On the 62d day after birth, the left eye exhibited corneal ulcer near the center of the cornea and the lower limbus. Ciliary injection and purulent discharge were

cornea to nearly two thirds of its depth from the external border, but less prominently in the deeper area. A few leucocytes were seen even in the neighborhood of Descemet's membrane. Corneal corpuscles showed proliferation and swelling, especially in the superficial layers. Just under the endothelium (parenchymal side), corresponding to the corneal ulcer, one or two layers of leucocyte infiltration were present. In addition to these epi-



Fig. 3 (Shiga). Showing patho-histological changes in the upper limbus of the right eye of young no. 1 from syphilitic mother rabbit no. 177.



Fig. 4 (Shiga). Showing the changes at the lower limbus of the same eye.

present. The iris was edematous and its outline was not distinct. The eye was enucleated on that day and subjected to histological study.

Near the center of the cornea, the epithelial cells were tumefied and proliferated, the epithelium was thickened, and infiltration of pseudo-eosinophilic leucocytes was seen. Subepithelially to this part, leucocytes and débris were darkly stained by hematoxylin. Near this part of the substantia propria, the infiltration of leucocytes was very prominent and resembled an abscess. Leucocyte infiltration was generally seen in the lymph spaces in the

thelial changes, the remaining epithelium showed degeneration.

At the limbus, infiltration of pseudo-eosinophilic leucocytes and round cells, and dilatation and congestion of capillary vessels were noted. Almost no change was seen in the deep layer of the sclerotic, but there were infiltration of pseudo-eosinophilic leucocytes and hemorrhage at the foot of the iris and in the ciliary body.

There was exudation at the angle of the anterior chamber. No change was seen in the vessel wall, there were no spirochaetae anywhere, nor could any bacterium be identified in the cornea by special

staining. The pathological changes observed showed that the process was acute.

(B) Young no. 1 from syphilitic mother rabbit no. 177 (group XV).

On the 56th day after birth, the right eye manifested corneal ulcer with purulent discharge. Dense opacity covered nearly two thirds of the whole cornea from the upper limbus, and the border between clear and opaque parts was very distinct. The iris was edematous so that

neighboring limbus (upper) showed remarkable pathological changes, such as proliferation of the epithelium with infiltration of pseudo-eosinophilic leucocytes, edema, dilatation and congestion of capillary vessels, hemorrhage, and marked infiltration of pseudo-eosinophilic leucocytes. Similar changes were seen in the deep layer of the limbus (fig. 3).

At the site of the epithelial defect, the uppermost layer of the substantia pro-

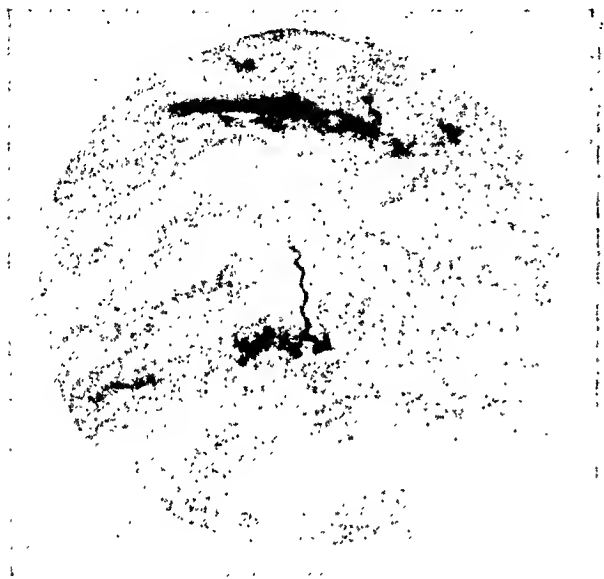


Fig. 5 (Shiga). Showing a spirochaeta in the cornea of this eye.



Fig. 6 (Shiga). Showing a spirochaeta in the liver of this rabbit.

its outline was not clear. Before enucleation, the aqueous humour of the anterior chamber and secretion from the conjunctiva were examined by dark-field illumination, but no spirochaeta was identified. The eye was enucleated on the same day, fixed in 10-percent formalin, and divided into two portions by vertical meridional section, one for hematoxylin-and-eosin staining, one for silver staining.

Three days later the rabbit died, and the left eye was then enucleated for examination, as were also the liver, spleen, kidney, and lung.

There were various histological findings. At the macroscopically opaque part of the right eye, the epithelium was torn out in a comparatively wide area. The

pria was thickened and looked like elastic membrane. Close to the limbus this fibrous tissue was interrupted by clumps of leucocytes and debris here and there. These bundles of fibrous tissues seemed to radiate into the substantia propria.

In the substantia propria itself, infiltration of pseudo-eosinophylic leucocytes in the lymph-spaces was prominent, especially in the anterior layer. The infiltration was rather diffuse and could be seen even in the part that appeared normal macroscopically.

Corneal corpuscles showed proliferation and tumefaction and were sometimes mixed with pseudo-eosinophilic leucocytes. Descemet's membrane was entirely normal, and no leucocytes could be seen

at the endothelium. Nor was there any pathological formation behind the cornea.

At the lower limbus infiltration of lymphocytes and plasma cells around capillary vessels was noticed (fig. 4). Vascularization could be seen directly under the epithelium of the cornea close to the limbus. Some capillary vessels in the limbus had thickened walls. Vascularization was also seen in the inner layer of the limbus, with perivascular round-cell infiltration and bundles of fibrous tissue running in irregular curls.

In the iris there were dilatation and congestion of blood vessels without any changes in the vessels themselves, but hyperemia and limited infiltration of pseudo-eosinophilic leucocytes were seen at the base of the iris and in the neighboring ciliary body.

With Jahnel's silver staining typical *Spirochaetae pallidae* were found in the cornea of the other half of this eye (fig. 5), but they were not numerous, at most one or two in a single section. They appeared more often in the superficial layer of the substantia propria than in the inner layer, but were not found at all in the epithelium, endothelium, nor in the limbus, although this showed definite pathological changes.

In the left eye, there was degeneration of the epithelium in the cornea; and at the limbus, infiltration of lymphocytes, plasma cells, and also a few pseudo-eosinophilic leucocytes were recognized.

There were no changes of Descemet's membrane, the endothelium, nor of blood vessels. *Spirochaetae* could not be identified in this eye, but those of typical shape were found in the liver (fig. 6).

DISCUSSION

The pathological changes at the lower limbus, remote from the ulcer, such as infiltration of lymphocytes and plasma cells, thickening of the vessel wall, perivascu-

lar cell infiltration, and vascularization directly under the corneal epithelium near the limbus and also in the inner layer of limbus with irregular running of fibrous tissue, demonstrate chronic inflammation. Such findings, however, as the infiltration of pseudo-eosinophilic leucocytes or a wide area of epithelial defect, are not observed in syphilitic interstitial keratitis in human beings nor in rabbits with experimentally induced syphilis.

It is interesting, however, to compare my findings with a few cases of interstitial keratitis in the human fetus reported by v. Hippel, Seefelder,⁸ and Cattaneo. The first two reported a defect of the corneal epithelium, while Cattaneo reported infiltration of leucocytes. Infiltration of leucocytes in the substantia propria and change of corneal epithelium in my cases resemble those described in the human fetus by these three investigators. I also found typical *Spirochaetae pallidae* in the cornea where little pathological change could be found.

It seems evident, therefore, that the pathological changes I have described can be considered syphilitic, and another type of interstitial keratitis, similar to that found in the human fetus.

CONCLUSION

One hundred forty-one eyes of 71 rabbits with congenital syphilis, ranging in age from very young fetuses to 93 days, were examined. Thirty-four eyes of 17 normal rabbits of corresponding ages were taken as controls. The conclusions are as follows:

1. Congenitally syphilitic rabbits are very liable to be born prematurely by abortion. Even if born at full term, they often die soon after birth. Their general development is below normal, and the development of ocular tissue is deficient as compared with that of normal rabbits.

2. Pathological changes noted are as

follows: (a) In the premature fetus and dead fetus born at full term—edema in the subcutaneous tissue of both lids; hyperemia and hemorrhage in the subcutaneous tissue of both lids, extrinsic ocular muscles, in the neighborhood of the lacrimal gland, conjunctiva, subconjunctival tissue, and the cornea.

(b) In the young which died shortly after birth—infiltration of round cells in the limbus, the sclerotic, the iris, the ciliary body, and extrinsic ocular muscles.

(c) In two young (aged 2 months) with corneal ulcer—in one of these I found spirochaetae in the cornea. Also prominent cell infiltration (pseudo-eosinophilic leucocytes) could be seen, especially in the anterior layer of the substantia propria, accompanied by a wide area of epithelial defect. The limbus (remote from the ulcer) showed such syphilitic changes

as perivascular cell infiltration, vascularization directly under the corneal epithelium near the limbus, and also in the inner layer of the limbus, with irregular curling of fibrous tissue, thickening of capillary vessel walls, and other changes.

Epithelial defect with subepithelial change is suggestive of a few cases of keratitis of the human fetus (congenital syphilis cases, or those supposed to be such) reported by H. v. Hippel, Reis,⁹ Cattaneo, and Seefelder, and my case is identified as a special type of interstitial keratitis, occurring in congenital syphilis of the rabbit, somewhat different from that in acquired syphilis.¹⁰

3. *Spirochaetae pallidae* were found in the cornea and the sclerotic, sometimes accompanied by pathological changes, sometimes not.

Fujimidai 1559.

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LATE RESULTS IN RETINAL-DETACHMENT OPERATIONS*

DOHRMANN K. PISCHEL, M.D.

San Francisco

The true value of any operative procedure can be estimated only by reviewing the results after a period of time has elapsed. This is especially true in the case of such a new and radical procedure as is employed by the various operations for the cure of retinal detachment.

The question that naturally comes up is whether the eyeball can stand such radical surgical insults as are suffered in a diathermy operation and, if it does withstand the immediate dangers, are there any late after effects which eventually negate the apparent immediate successful outcome.

Such possible late results are: (1) re-appearance of the retinal detachment; (2) degeneration of the macula; (3) atrophy of parts of the retina; (4) optic atrophy; (5) scleral ectasia; (6) troublesome hyperphoria; (7) most important of all, development of cataract.

Weve¹ reported a very complete résumé of the results of operations for retinal detachment at the Utrecht Eye Clinic. However, in this paper he gave no detailed report of the late results. Weve made some very valuable suggestions regarding comparative statistics, giving several broad classifications which, if adhered to, would enable one to compare fairly accurately statistics of different types of operations from different operators. It is to be hoped that such a classification will be generally adopted. He classifies as complicated the following types: (1) aphakia, or with luxated lens; (2) macular hole, or perimacular or peripapillary tear; (3) nystagmus; (4) mac-

rophthalmus or other congenital abnormalities; (5) glaucoma; (6) cases in which operation was unsuccessful elsewhere.

All others he calls "uncomplicated," although many are admitted to be very difficult.

Surveys of the end results of retinal detachment operations were also reported by F. Ramach,² covering all the differently operated-on eyes at Lindner's Clinic in Vienna. He reported a total of 77 permanent cures (50 percent) out of 159 cases, many of them "complicated," but did not go into details concerning the condition of the eyes at the time of re-examination. He mentions atrophy of the globe and complicated cataract among the unsuccessful cases, but does not give any statistics regarding the healed ones.

It seemed important to seek an answer to these questions as they applied to the diathermy operation for detachment, which is the one chiefly used in the United States. While not comprising so large a material as others have reported on, I felt that the statistics from 63 unselected consecutive cases with 37 cures—that is, 58 percent—of over a year's duration would be valuable. Therefore I reexamined as many of the patients with retinal detachment that I had successfully operated upon as could come to San Francisco. A few others were examined by local physicians in their home cities, to whom I am very grateful, and others have answered by mail as to their present condition. Unfortunately, five of the cured patients could not be reached, so only 32 are entered in this study. For this survey only those patients were reexamined who had been operated upon at least one year ago.

* From the Division of Ophthalmology, Stanford Medical School. Preliminary report of this paper was read before Pacific Coast Otoophthalmological Society, Salt Lake City, May 26, 1937.

It was felt that the most recent cases were too fresh to give a reliable picture of late conditions. All had been operated upon by the Safar method of multiple diathermy puncture. While in the earliest cases only one line of pins had been inserted, in all later cases double rows of pins were used. Transcleral treatment (Larsson) or application of bident electrode (Walker) was also employed to supplement the above. Patients were kept in bed with binocular bandage for two weeks postoperatively. They then wore stenopeic glasses for two months. When these were discarded the patients resumed their normal activities.

RESULTS

The result of the reëxamination furnished the facts from which I was able to answer all the questions enumerated above. These answers were favorable, surpassing the most optimistic expectations. They are briefly discussed in the following paragraphs.

Reappearance of detachment: Of the 32 cured patients who were reëxamined, all have stayed cured for a minimum of at least a year. Included in this are four who were operated on twice. In these four cases, the detachment reappeared within three months of the first operation; the patients were successfully operated upon a second time, and the retinas have remained attached since then. A fifth patient was operated upon three times before being cured, each recurrence coming well within three months of the last operation. No detachments recurred that had remained cured over three months. It may therefore be said that if a case is cured for a period of three months no relapse is to be anticipated.

This statement necessitates a brief explanation of the length of after-care of our patients. They wear stenopeic spectacles for two months after the operation,

as mentioned before, and then discard them. Their eyes therefore resume normal rotations at that time. Therefore any retina which had remained in place merely because of this immobilization of the eyes, and not because successfully reattached, would very quickly again detach itself and once again appear as a regular retinal detachment. It might therefore be better to figure the duration of a cure from the date when the eyes resume their normal movements, rather than from the date of operation, as some operators restrict their patients in the free use of their eyes for many months postoperatively. One ophthalmologist even has them wear stenopeic glasses for a year! This prolonged period of convalescence might explain some of the relapses reported as occurring after a "cure" of many months' duration.

A further interesting fact of this study is a cured one-eyed patient, whose original detachment had occurred two weeks after a moderate blow on the head, who subsequently suffered a severe contusion to the head many months after the operation. No detachment occurred this time, giving added proof that the retina, once firmly attached, is as well as before the operation, or even better.

Another patient, six months after the operation, fainted, striking her head on a basin, yet suffered no relapse, again demonstrating the efficacy of the operation.

Degeneration of the macula: The vision in all but three of these cases has remained at the best level to which it returned after the operation. In one of these three cases in which the vision became worse there was a traumatic cataract, due to a perforating injury with iris prolapse. Here the traumatic cataract developed further, so that the vision was greatly reduced. Another was also a traumatic case in which a posterior subcapsular lens

opacity is developing. The third was a complicated cataract, to be described later. The fact that in all other cases the vision did not deteriorate shows that there was no late degeneration of the macula.

Atrophy of the retina: No late atrophy of the retina was noted. The operated-on areas showed typical pigment hypertrophy and irregular choroidal atrophy in the region of the pin punctures, but elsewhere the fundus was normal. The marked pigment hypertrophy seen a few months after the operation usually diminished considerably after the lapse of a year. Ophthalmoscopic examination further revealed the interesting fact that the retinal vessels could almost always be traced crossing over the atrophic areas undistorted, to be seen disappearing in the periphery in a normal manner. This is interesting proof of the lack of destruction of all layers of the retina. While the pigment epithelium and even the rods and cones may be destroyed, the inner layers of the retina are preserved. The fact that the retina did not atrophy later is further borne out by the tests of the visual fields. The visual fields remained constant, no shrinkage from the immediate postoperative findings being noted in any case but one. In cases in which very extensive areas far back from the limbus had been operated upon in one part of the retina, a slight constriction of the field corresponding to this area would have been found immediately after the operation, and this change remained constant but did not increase. The only exception to this rule was in the case of the one patient who was operated upon three times: a field defect developed a few months after the last operation in the area which had been operated upon twice, and here the fundus showed marked choroidal changes.

Optic atrophy: No optic atrophy could

be noted objectively, with ordinary or red-free light.

Ectasia of the sclera: Examination of the sclera in the operated-on region and of the fundus revealed no case of ectasia of the sclera.

Troublesome hyperphoria: The possibility of a marked permanent hyperphoria remaining in cases in which a complete tenotomy of a vertical rectus had been performed at the time of the operation was studied.

There were 16 cases of complete tenotomy of a vertical rectus in two-eyed patients and 2 cases of such a tenotomy in patients with monocular conditions. These latter two are, of course, disregarded. The muscles were all resutured to the muscle stump. Of the 16 cases of complete tenotomy in two-eyed patients, 10 had no hyperphoria resulting from the operation or so little, 0.5 to 2.0 prism diopters, that it did not trouble them.

Six patients had a marked hyperphoria. One case was of a woman whose eye had previously been unsuccessfully operated upon by the Gonin method. The hole was just under the superior rectus, so that it was necessary to cut it off on two occasions. There developed a troublesome hyperphoria of 12 prism diopters. As the patient was quite uncoöperative subsequent muscle surgery to correct this was not undertaken.

In the second case there had previously been a marked hyperphoria, for the patient was wearing 10 prism diopters of vertical prisms in her glasses before the operation. Subsequently a marked hyperphoria developed postoperatively (26 prism diopters of hyperphoria). A cinch shortening of the superior rectus of the opposite eye reduced this to 5 prism diopters, making the patient quite comfortable.

The third was in one of the patients

operated on twice. Here a hyperphoria of 6 prism diopters developed, but this receded to 3 prism diopters after a year. With this corrected by prisms the patient had single binocular vision and read comfortably.

The fourth patient had a two-stage operation with tenotomies of the inferior and, later, superior rectus. Before the operations she already had a hyperphoria of 6 prism diopters, for which she had been wearing prisms. Subsequently, she again was comfortable with prisms in spite of 7 prism diopters of hyperphoria.

The fifth patient had a hyperphoria of 4 prism diopters, but was absolutely comfortable. This, in spite of the fact that the operated-on eye had reasonably good vision (15/50).

Thus of the 16 cases with complete tenotomy of a vertical rectus, three needed prisms to be comfortable, one needed a muscle operation, and one, refusing both, was uncomfortable. In other words only one out of 16 was uncomfortable from hyperphoria.

There were four cases in two-eyed people operated upon without tenotomy. Of these one developed a hyperphoria of 2.5 prism diopters which, fortunately, did not trouble him. Another developed 7 prism diopters which also did not trouble him, probably because the eye had been amblyopic since birth.

A third patient developed a hyperphoria of 10 prism diopters after tenotomy of the external rectus. In spite of vision as good as in his unoperated-on eye, he had no complaints.

From the foregoing it can be seen that troublesome hyperphoria never develops as the result of a complete tenotomy of a vertical rectus (with muscle resutured to insertion), when only one operation is undertaken. A slight hyperphoria may develop without tenotomy, due to the

formation of scar tissue.

Of course in some cases a complete tenotomy of the internal or external rectus was performed. This might, and often did, result in some exophoria or esophoria. However, exophoria and esophoria are such frequent findings that their presence could not certainly be charged to a tenotomy. Furthermore, considerable exophoria or esophoria may be present, usually without subjective symptoms. Therefore the presence or absence of horizontal heterophoria has not been studied in this résumé.

Development of cataract: The lenses showed no abnormal development of cataract, with the following exceptions:

The first traumatic case has already been described as a traumatic cataract following a perforating injury with rupture of the lens capsule and iris prolapse. Here the lens became quite opaque, preventing a view of the fundus.

The second case was also traumatic, the eye having been struck by a flying piece of wood, with a blow severe enough to keep the patient from work for two weeks. A lens opacity developed slowly just under the posterior capsule, in the temporo-inferior quadrant. It had a typical "ground-glass" appearance, which is so characteristic of lens opacities developing after contusion of the eyeball. Vision has decreased slightly from 15/50 to 15/70.

The third case was in a boy, aged 16 years. The lens when examined with a slitlamp showed five or six striate opacities, placed almost like "riders" in the peripheral cortex of the temporal superior quadrant; they did not interfere with vision. These could very possibly be the result of the original contusion, which had been severe enough to cause a massive hyphema, and therefore may also be classed as a traumatic cataract.

In the fourth case there was a tremendous postoperative reaction, with marked iritis, hypopyon, edema, and so on. It was necessary to resort to intravenous typhoid vaccine injections to combat the uveitis. Whether this was an exogenous infection or a marked endogenous uveitis could not be determined. The eye finally quieted down but showed a typical complicated cataract, with posterior synechia. The development of this lens opacity was thus obviously not due to the diathermy current, but rather due to the cyclitis.

In the last case, a woman of 55 years was operated on twice. Diathermy had been confined to the temporal portion of the eye. Several months later the lens developed a peculiar opacity in the anterior and posterior nasal quadrants, outside of the pupillary area. The nuclei of both lenses were sclerotic and both lenses contained many fine senile opacities. While the operation very possibly caused this lenticular opacity in the cortex, this cannot be certified. The opacity has not increased in size in nine months.

As most of the other cases were in persons over 50, numerous lens opacities were found. These, however, were always similar to opacities found in the lens of the unoperated-on eye and were typical of senile changes as seen in other patients. Thus, except for the one case just described, in spite of the fact that in many cases the diathermy current had been applied as close to the limbus as 8 mm., no untoward effects attributable to the diathermy current were seen in the lens. One may therefore be assured that

the diathermy operation will not cause formation of cataract in the lens.

SUMMARY

Of the 63 patients who had been operated upon at least a year previously, 37, or 58 percent, had a successful issue. Of these 37 successful cases, only 32 could be found for reexamination.

All cases had been operated upon by the Safar method of multiple diathermy puncture. While in the earliest cases only one line of pins had been inserted, in all the later cases double rows of pins had been used, together with transcleral treatment (Larsson) or with bident electrode.

There were four cases of more than four years' standing, five of more than three years', six of more than two years', and eighteen of more than one year's standing.

No relapse had occurred in any case which was "cured" for three months.

Four patients "cured" had a recurrence within three months of the first operation, but were permanently cured by a second operation, while a fifth had two recurrences within the same period of time and was cured by a third operation.

Only one case of cataract developed in previously uninjured lenses.

Three cases of traumatic complicated cataract showed an increase in density of the lens opacity, as did one of complicated cataract.

All vision once regained was successfully retained except in three cases of cataract.

490 Post Street.

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PAPILLITIS AND PAPILLEDEMA IN MULTIPLE SCLEROSIS*

SAUL SUGAR, M.D.

Chicago

The polymorphic manifestations of multiple sclerosis are not infrequently seen by the ophthalmologist, since ocular symptoms occur in about half of all cases of this disease at some time during its course. Cases with papillitis and papilledema, however, have been relatively few, especially in the recent literature. Marshall and Laird¹ in their recent review of 100 cases of multiple sclerosis mention four cases of blurring of disc margins or actual neuritis but no case of papilledema.

Review of the literature reveals 36 cases of multiple sclerosis in which definite papillitis or papilledema was described. Of these the majority were in females, as in the general group of cases of multiple sclerosis. The ages varied between 13 and 40 years.

Bruns and Stölting² in 1900 reported two cases of bilateral choked disc with diminished visual acuity and neurologic signs. Both cases were diagnosed as tumor cerebri. The disc elevation receded in both. The first patient had normal discs and vision 10 months later. The second came to autopsy and was proved to have had multiple sclerosis. Rosenfeld³ in 1903 reported a case with bilateral choked discs, diagnosed as tumor cerebri. Later neurological signs caused a change of the diagnosis to multiple sclerosis. This was proved on subsequent pathological examination.**

* From the Findlay Service, Illinois Eye and Ear Infirmary, Dr. Harry S. Gradle, director, and the Michael Reese Hospital, Department of Ophthalmology.

** Since writing this paper, the author has found three additional cases of unilateral papilledema, one of which was at first thought to be a case of frontal tumor, described by L. Paton (Papilledema in disseminated neuritis.

A total of 14 cases with bilateral choked disc have been reported by Tschirkowsky,⁴ Frank,⁵ Wilbrand-Saenger,⁶ Marburg,⁷ Oloff,⁸ Weil,⁹ Schaeffer,¹⁰ Fleischer,¹¹ de Montaud,¹² and Adler.¹³ Two cases of multiple sclerosis with unilateral choked disc were reported by Hillel¹⁴ and Tarle.¹⁵ Fleischer¹¹ has reported 12 cases of acute papillitis, six of which later developed multiple sclerosis. Four of the latter were bilateral.

Eleven cases described as having been of acute papillitis in multiple sclerosis were reported by Müller,¹⁶ Langenbeck,¹⁷ Wendenburg,¹⁸ Oppenheim,¹⁹ Kyrieleis,²⁰ Fox,²¹ Bollock,²² and Petry.²³

CASE REPORTS

Two cases of definite clinical multiple sclerosis with choked disc are presented:

Case 1. Mrs. M. N., a 39-year-old white female, presented herself on April 12, 1938, because of sudden loss of vision in the left eye one week previously. There had been no inflammation nor pain. Vision was 20/25 in the right eye, corrected with +0.75 D. sph. \approx +0.75 D. cyl. ax. 90°. With the left eye the patient was able to count fingers at two feet. Examination of the disc and fundus of the right eye revealed no abnormality. The disc of the left eye was elevated 2½ diopters, with several small hemorrhages on its upper part. The physiological cup was present, although the lamina cribrosa could not be seen. There was no involvement of the surrounding retina nor haziness of the vitreous. Vessels, macula, and periphery were normal. Visual-field examination of the right eye was entirely normal. The

Trans. Ophth. Soc. U. Kingdom, 1914, v. 34, p. 252).

left peripheral field was contracted concentrically to within 10 degrees of the fixation point, using a 5-mm. white target on the Ferree-Rand perimeter. A relative central scotoma for white, absolute for colors, was present at the fixation point only, using a 5 mm. target at one meter's distance. Tactile tensions were normal. Slitlamp examination revealed no evidences of inflammation in the anterior segments. Although the appearance of the disc was that of papilledema, a tentative diagnosis of optic neuritis of the left eye was made because of the visual disturbance. The patient could not enter the hospital immediately for etiological investigation so 10 c.c. of boiled milk was given intramuscularly.

Six days later the patient entered the hospital. At this time additional history was obtained of stiffness in the legs, especially in the morning, for the past three months, and dizziness for a year prior to the onset of the present visual difficulty. Vision in the left eye was now 20/200 uncorrected and corrected with +1.25 D. sph. \approx +0.25 D. cyl. ax. 90°. The disc was now elevated only 1½ diopters. The peripheral field was normal. The central scotoma remained unchanged, and the blind spot was slightly enlarged. Nystagmus was noted upon the patient's looking to the right side and on looking upward. Blood counts and urine examination were normal. The blood Wassermann reaction was negative. The Mantoux test was slightly positive. X-ray films of the teeth were negative. Clinical ear, nose, and throat examinations revealed no pathology. X-ray examination of the sinuses showed slight haziness of the right antrum. Physical examination revealed only neurological findings suggestive of multiple sclerosis. A corroborating neurological examination by Dr. C. Neymann revealed the following positive findings:

Horizontal nystagmus on looking to right and upward. The tongue on extension deviates slightly to the right. Absent abdominal reflexes. Both legs spastic with positive Babinski bilaterally. Abortive knee and ankle clonus. Exaggerated knee and ankle jerks. Slightly exaggerated right biceps reflex. Drooping shoulders. Spastic gait. Positive Romberg sign. X-ray films of the skull were negative. Spinal puncture: Wassermann, negative; Pandy and Ross-Jones, negative. No cells. Gold-sol curve 2332111111.

On April 22, 1938, 10 days after the first examination, vision in the left eye was 20/65. A small absolute central color scotoma was present. On April 26th the vision in each eye was 20/25 plus 2. There was no central scotoma. The disc of the left eye was flat, with slight blurring of the margin nasally; no temporal pallor.

The patient received two intravenous injections of 15 and 25 million killed typhoid bacilli, respectively, on April 19th and April 26th.

Case 2. W. T., a 28-year-old, single, white female, entered the hospital on June 6, 1933. She had been well until four weeks previously. After walking all day she suddenly became dizzy one night and began to have nonprojectile vomiting. She noticed that turning her head to the left or lying on the left side produced dizziness and at times retching and vomiting.

Tinnitus in the left ear had been present for one to two days at onset of the present illness but did not persist. This was followed by impaired hearing on the left side and a feeling of numbness about the left ear and left side of face. With the onset of impaired hearing, the patient noticed sudden blurring of vision. She was able to see motion but could not define objects even at close range.

At the onset of this difficulty the patient began to have weakness of the left arm and leg. The leg weakness improved after several days. Occasional paresthesias in the left arm and leg were pres-

ent. Occasionally the arm and leg began to shake spontaneously. At times, in grasping for objects, the patient could not control the direction of her hands.

Three weeks before admission the patient had had an episode of dizziness, nausea, and vomiting associated with a dull aching pain in the right lower quadrant. No fever was present. She was operated on for appendicitis with uneventful recovery. The symptoms, except the dull abdominal pain, remained unchanged.

The patient had had occasional transient suboccipital headache during the four weeks prior to admission.

Neurological examination on June 7, 1933, by Dr. T. Stone revealed the following positive findings:

The right palpebral fissure was wider than the left. Bilateral VIth nerve weakness, left greater than right. Occasional spontaneous lateral nystagmus and lateral nystagmus on fixation to the right and left, more so to left. There was apparent inability to raise the eyeballs upward. Pupils were dilated and reacted sluggishly to light, less sluggishly to accommodation. Left cheek and upper lip hyperesthetic. Defective left hearing. Left angle of mouth did not move so well as the right nor did it elevate so high as the right. Left hemiataxia. Wrist, triceps, biceps, supinator, knee, and ankle jerks were bilaterally present and slightly diminished. Abdominal reflexes were present, greater on the right than on the left. A diagnosis of posterior-fossa lesion suggestive of arachnoiditis or cerebellopontine angle tumor was made.

Hearing examination by Dr. S. Pearlman revealed left middle ear or conduction type of deafness.

Ophthalmoscopic examination was made on June 11th by Dr. Leo Mayer, with the following observations: *Right eye.* The media were clear. The disc was distinctly outlined with mild temporal pallor. The arteries were somewhat attenuated and the arterioles of the macular region tortuous. Otherwise the fundus was entirely normal. *Left eye.* The media were clear. The disc was distinct in outline, especially on the temporal side,

which was markedly pale. The central excavation showed more definitely than in the right eye but the lamina cribrosa was not seen. The arteries were similar to those of the right eye. Vision of the right eye was ability to count fingers at 6 inches; of the left eye, ability to count fingers at 12 inches.

Spinal-fluid examination: The fluid was clear; the pressure not increased. Pandy and Ross-Jones reactions were negative; 6 cells per cu. mm. Wassermann reaction was negative. Lange's gold-sol curve, 0000110000.

Blood Wassermann reaction was negative. RBC 4,200,000; hemoglobin 70 per cent; WBC 8,100; differential normal; blood sugar, 60; NPN 28. The urine showed a trace of albumin, with many white cells in clumps.

On June 20th cystoscopy revealed an acute generalized cystitis with loss of trabeculation in the bladder. The urinary function became normal on acidifying the urine and the instillation of 20-percent argyrol into the bladder.

X-ray studies of the skull revealed no evidence of pathology.

The patient was placed on quinine therapy and discharged on July 11, 1933, with a diagnosis of multiple sclerosis.

The patient was well at home except for dizzy sensations when resting on the left side until July 31, 1933, when she noticed a black cloud in front of her left eye. Within a few hours there was a complete loss of vision.

On readmission to the hospital on August 3d, the eye examination by Dr. M. L. Folk revealed that both pupils were dilated 7 to 8 mm., and did not react to light. No light perception was present in either eye. The right disc was elevated 4 diopters and markedly edematous. The veins were markedly distended and the arteries narrowed. The vessels were buried in the

edema and appeared interrupted in their course. The disc of the left eye appeared the same, elevated $2\frac{1}{2}$ diopters. There were a few small hemorrhages on the upper disc margin.

Two intravenous injections of 50-percent glucose solution were administered on the following day. From then until the 21st of August, six intravenous injections of typhoid vaccine, beginning with 15 million bacilli, were administered. These were gradually increased to 200 million bacilli in the last dose.

On August 29th the discs were flat and well outlined. Vision increased until, on September 6th, the patient was able to recognize large objects close by with each eye. Vision slowly increased to 20/65, corrected in each eye, and has remained the same to the present time. Both discs show secondary atrophy.

COMMENT

These cases are examples of the two different types recorded in the literature, the first type with unilateral choked disc and marked visual disturbance with rapid regression. Often the second eye becomes involved at a later date. The second and more frequent is the bilateral type, resembling cases of intracranial tumor. The ophthalmologist may assist greatly in the differential diagnosis of these cases.

In nearly all of the reported cases no record of the amount of disc elevation was made. Thus some difficulty may occur in distinguishing between some of the cases of papillitis and papilledema. In both cases reported here the appearance of the disc was that of choked disc with visual findings of optic neuritis. It is probable that in each the mild inflammatory signs were obscured by the signs of papilledema. In neither case was there any involvement of the surrounding retina nor filling of the physiological cup with inflammatory exudate extending into

the vitreous around the disc, as would be expected in a case of optic neuritis *per se*. This idea of mild inflammation superimposed by edema agrees with the histopathological findings reported in the literature.

Two views are held as to the nervous-tissue change in multiple sclerosis. Has-sin²⁴ believes it to be a degenerative process due to some unknown toxin, probably endogenous. Spiller²⁵ regards it as the result of a previous inflammatory change of an acute nature.

Holden²⁶ states that characteristic plaques may occur at any point in the optic nerves or tracts and involve the axial fiber bundles with great frequency. The inflammatory exudate that occurs at first merely compresses the optic-nerve fibers and interferes with their function. Later the medullary sheaths break down and glial proliferation occurs. The axis cylinders are not usually destroyed.

Rosenfeld,² in his cases, reported plaques in the chiasm and both optic nerves. The optic nerves were in places reduced to the size of the oculomotor nerve. Immediately behind the lamina cribrosa on each side were found foci in which the myelin sheaths of the nerve fibers were absent but most of the axis cylinders remained intact. The dural sheaths were in contact with the nerves in these areas.

Tschirkowsky,⁴ in histopathologic studies of his case, noted widening of the perivascular lymph spaces, infiltration of the tissue spaces with small granular cells, and glial proliferation.

From the foregoing one may conclude that a plaque immediately behind the lamina cribrosa causes the typical infiltration, dilatation of the perivascular lymph spaces, and involvement of the axial fibers. Swelling of the nerve in this area within the nonyielding dural sheath may cause venous compression and papilledema.

SUMMARY

Two cases of choked disc occurring in multiple sclerosis are presented together with a review of the literature.

In any case of choked disc with marked impairment of vision, multiple sclerosis should be considered in the differential diagnosis.

Recognition of the occurrence of this condition may help avoid unnecessary neurosurgical procedure.

I am indebted to Drs. Leo Mayer and Theodore Stone for permission to report the second case.

904 West Adams Street.

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DYSOSTOSIS CRANIO-FACIALIS (CROUZON)

ARLINGTON C. KRAUSE, M.D.,* AND DOUGLAS N. BUCHANAN, M.D.*
Chicago

Innumerable cases of malformation of the head and face with associated ocular symptoms have been reported from the time of von Graefe in 1866. The least confusing of all the systems which have been recommended for these cranial deformities is the classification of Waardenburg.¹ He has classified high brachycephalic skulls into the acquired form, or hypsicephaly, and the true form, or acrocephaly. Under the hypsicephaly belong all the kinds of skulls that are more or less pointed during the course of cranial development by the effect of diseases with a definite etiology such as syphilis, meningitis, and rickets. Under acrocephaly are grouped acrocephalia anterior, media, and posterior. Although intermediate forms are known, acrocephalia media has four quite well-defined secondary groups; that is, (a) oxycephaly proper (often called tower head, ox-head or turriccephaly), (b) acrocephalo-syndactyly of Alpert, (c) hypertelorism of Greig, and (d) craniofacial dysostosis of Crouzon (sometimes called parrot head or Papageienschädel).

Dysostosis cranio-facialis is the name of a rare cranial deformity which has not been reported under this name in the United States. It is a disease typically characterized by exophthalmos, atrophy of the maxilla, prognathism of the mandible, and deformity around the sagittal suture and bregma. Cases of this disease may have been unknowingly taken as examples of oxycephaly because the history and examination of the patient as recorded in the literature are frequently

insufficient to place this disease in the subdivision of oxycephaly.

Etiology and pathology. Dysostosis cranio-facialis appears to be a primary developmental anomaly. There is no good reason to suppose that the disease is caused by rickets, syphilis, fetal meningitis, or osteitis. Ida Mann,² who has brought forth a theory based on ontogenetic and phylogenetic reasons, states:

The primary anomaly is undoubtedly failure of the lower part of the skull to expand. This places the defect primarily in the mesoderm, from which are formed the bones of the base and sides of the skull. If we now consider the results of this failure of mesoderm, ectoderm being unaffected, we should realize in the first instance that the rapidly widening brain growing at its normal rate will not be properly accommodated within the too narrow skull. This will lead to two things, firstly, expansion of the only normal portion of the skull, namely the vault, and secondly, raised intracranial tension (giving rise to convulsions, headaches, papilloedema, and consecutive optic atrophy). The shape of the skull and the condition of the eye are thus determined by the primary mesodermal failure in the region of the alisphenoids and temporals. The continuance of a high intracranial tension during the growth period will lead to a secondary thinning of the skull-bones (digital impressions). . . .

Symptoms and physical signs. The remarkable characteristics of dysostosis cranio-facialis may vary to any degree, from a scarcely recognizable deformity to the extreme deformation that is noted in the description of the case presented here. The end effect is apparently dependent upon the duration and rapidity of the development of the anomaly. The oxycephalic apical bulge of the cranial vault may take various shapes such as a small boss, dome, or even a crest. The peculiar facial distortion may be slight or marked.

The chief ocular symptoms are: exophthalmos, optic atrophy, strabismus, nys-

* From the Division of Ophthalmology, Department of Surgery, and the Department of Pediatrics, University of Chicago.

tagmus, and obliquity of the palpebral fissures. Exophthalmos may be noticeable from birth and may precede the cranial malformation. It is always extreme in craniofacial dysostosis because of intra-orbital venous congestion arising from the constriction of the orbital foramina and because of the shallowness of the orbital cavities. Luxation of the bulb may occur. Optic atrophy is caused by (a) intracranial hypertension, (b) mechanical traction resulting from the malformation of the base of the cranium and optic foramina which lengthens the optic canal, and (c) constriction of the optic foramina, especially transversely. Total blindness may occur from these effects. Strabismus is attributed to amblyopia resulting from optic atrophy, to muscular deficiency, and to malformation of the orbits. In cases with optic atrophy, nystagmus may be observed. The obliquity of the palpebral opening is contrary to that found in mongolism. If the lids are prevented from closing by the exophthalmos, corneal disease occurs.

The facial characteristics are: an arched nose with widening and depression of the nasal root, a prognathism of the lower maxillary, and an atrophy of the maxilla.

The cranial malformation results from the deformity of the sagittal suture and bregma and also from the intracranial hypertension giving rise to interdigital impressions of the skull.

The disease generally shows a familial and hereditary character.

Besides the typical form of this disease first recognized by Crouzon,³ there are cases in which the cranial defect is similar to oxycephaly. Vogt's⁴ case with syndactyly is a reminder of the disease described by Alpert.⁵ These intermediate forms suggest that the various subgroups of oxycephaly have a relatively similar origin. The Crouzon subgroup seems to show a

dominant heredity. Most of the cases that have been described are in the literature of the Latin countries and are patients of French stock.

Differential diagnosis. The diagnosis of dysostosis cranio-facialis may be easily confused with hypertelorism but not with oxycephaly proper or acrocephalo-syndactyly. The characteristics of hypertelorism are: large triangular orbits with a large angle of axial deviation, enlargement of the nasal bones, atrophy of the superior maxillary bone and foetal appearance of the lower maxillary with prognathism, prominent frontal protuberance, and lack of digital impressions of the skull.

Prognosis. The incomplete chronological history of these cases makes it difficult to predict the final outcome. Few deaths have occurred from intercurrent diseases. Several patients have reached old age. A low mentality indicates a poor prognosis.

Treatment. The malformation cannot be corrected by any known means. A decompression may serve to decrease the intracranial hypertension and operative procedures may release the pressure on the optic nerve. The condition of the eyes should be watched and appropriately treated by an ophthalmologist.

REPORT OF A CASE

R.P., a boy, aged 2½ years, American (figs. 1 and 2), was brought to the clinic for an examination. The mother believed that the child was not normal in appearance and was slow in development. The father and the other two children were living and well and were normal physically and mentally. The mother had frequent major convulsions. The father's brother had five children, one of whom had an absentminded appearance and was delayed in learning to talk, walk, and control his bowels. The patient was a full-term breech-delivered infant, weighing



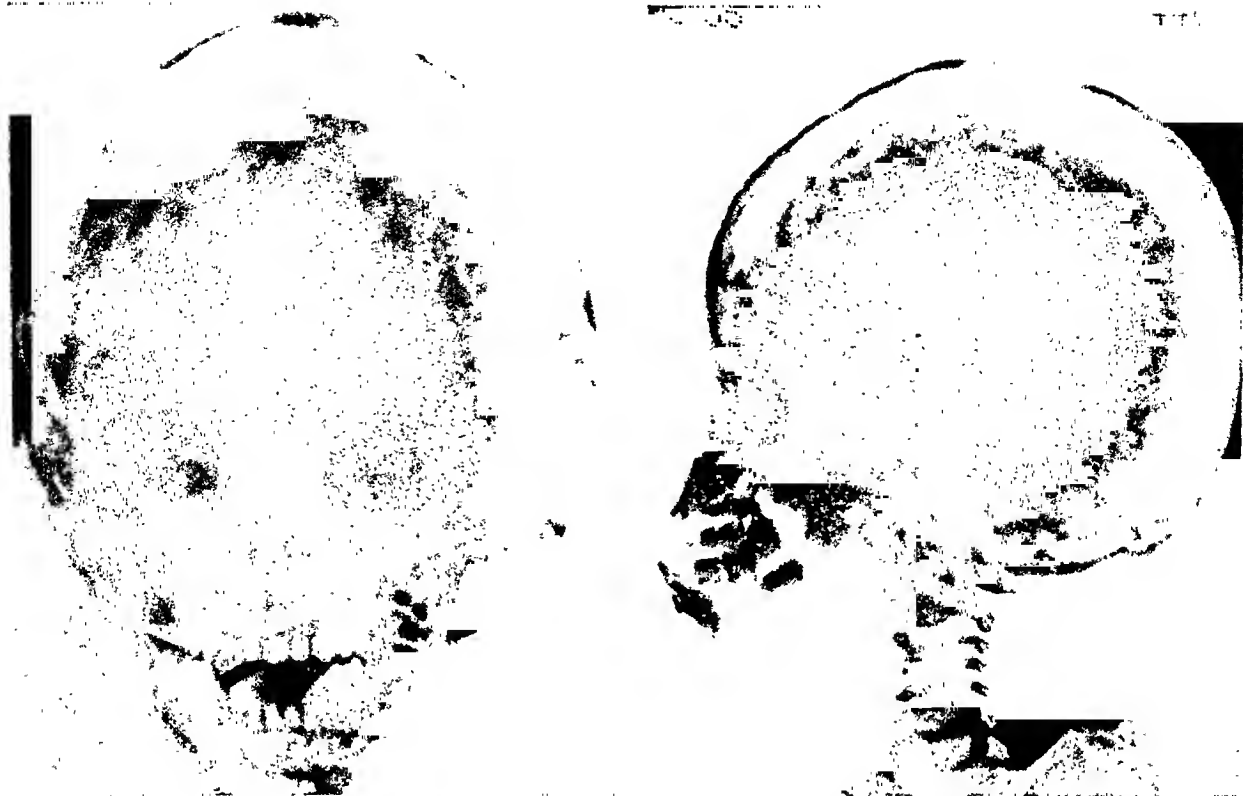
Fig. 1 (Krause and Buchanan). A case of craniofacial dysostosis.



Fig. 2 (Krause and Buchanan). Same case, profile.

7.5 pounds (3.4 kg.). He fed himself at 12 months; walked at 17 months; used two to three words together and associated words with objects at 27 months. Bowel movements were trained but urina-

tion was uncontrolled. The child was breast fed for six weeks and then placed on a formula of cow's milk. At one year of age he had one convulsion. Shortly after this he had whooping cough and



Figs. 3 and 4 (Krause and Buchanan). X-ray studies of a case of craniofacial dysostosis.

measles. At 15 months his tonsils and adenoids were removed. There was no history of accident nor other operations. No signs of syphilis were found.

Examination. The patient was a well-nourished child with queer appearance. The occipito-frontal circumference was 49 cm. The anterior fontanelle bulged upward. The palpebral openings slanted down and inwards about 15 degrees. These openings were 3 mm. wide when the child was asleep. The moderate ptosis of the upper lids resulted in a wrinkled brow. The widely set eyes were parallel. In sleep they diverged markedly. As measured on the Hertel exophthalmometer, the right eye was 27 and the left eye 26 mm. when the instrument was set at 99 mm. The external ocular movements were normal. The corneae were clear and were 12 mm. in diameter. The anterior chambers were of normal depth. The iris patterns were well made out. The pupils reacted to light and during accommodation. The tactile tension was normal. The re-

fractive media were clear. The fundus examination showed that the disc margins were blurred and the vessels were markedly arched over the pale papilla. No macular lesions were seen. The short pointed nose appeared excessively broad at the root. The mouth was constantly held open and the tongue slightly protruded. The breathing was stertorous and accompanied by drooling of the saliva. The palate was highly arched. The chest was pigeon breasted. Over the coccyx a pilonidal cyst was found.

Laboratory data. Urine, blood count, and spinal fluid were normal. The blood and spinal-fluid Wassermann tests were negative. The roentgen examination (figs. 3 and 4) showed that the vault of the skull was extremely thin and the sutures were closed. Digital impressions were prominent. The area about the anterior fontanelle protruded outwardly. A diploic channel was seen. Sphenoidal ridges and orbits were normal. Marked absorption was found about the roots of the teeth.

The mandible gave the appearance of prognathism because the bones of the face around the nose were incompletely developed. The sella turcica was large. The posterior clinoid was enlarged. The bones of the left hand and forearm showed decreased density of the cortex and an increase of the trabeculation.

A diagnosis was made of craniofacial dysostosis, hydrocephalus, bilateral exophthalmos, papilledema, and secondary optic atrophy.

Subsequent history. The child was sent home and 48 days later was admitted to the hospital. An osteoplastic frontal exploration of the skull and decompression of the right orbit and right subtemporal region were performed on the second day in the hospital. A week after the operation the conjunctiva of the right eye was moderately injected. The weakness of the winking reflex of the right eye and the tendency to keep the eye open resulted in a small superficial corneal opacity. Four weeks after the operation the condition of the left eye was unchanged. The exophthalmometer reading was: right, 33

mm., left 26 mm. at 98 mm. The examination of the right eye showed that it diverged about 45 degrees and possessed no power of convergence. The pupil of the right eye was 7.5 mm. in diameter, and of the left, 5.5 mm. The pupil of the right eye gave no direct reaction to light. The interpupillary opening of this eye was 15 mm. wide when the child was sleeping and 16 mm. wide when awake or 5 mm. wider than that of the left. A mild conjunctivitis persisted in spite of constant treatment, and the central corneal epithelium tended to become eroded.

SUMMARY

Reported in this article is a case of dysostosis cranio-facialis or Crouzon's disease with typical symptoms and confirmed by roentgen-ray examination. There is no apparent record of this disease in the American literature. In spite of operative decompression of the cranium and right orbit there is no reason to believe the prognosis will be favorable for either the eye, mentality, or life.

950 East Fifty-ninth Street.

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LECTURES ON MOTOR ANOMALIES*

VI. PRINCIPLES OF SURGICAL TREATMENT

A. BIELSCHOWSKY, M.D.

Hanover, New Hampshire

Divergent squint has a much better prospect with regard to treatment. There are several reasons for this. First, it occurs very seldom in earliest childhood. Most of the patients have passed their sixth year, so that the development of the fusion apparatus is complete when the divergent squint appears. In a relatively high percentage of the cases the squint remains periodic if the fusion tendency is able to overcome the anomalous position of rest by the convergence innervation. Cases of divergent squint have the advantage that the compensating convergence innervation is dependent on the will and has a larger amplitude than all the other fusion innervations. Therefore, convergence exercises will produce a better result than will the divergence exercises required in convergent strabismus. Further, in divergent squint the risk of getting an overcorrection by the proper operative procedure is relatively small, whereas in convergent squint this danger must always be considered, particularly in early childhood. As was said before, the change of the topographic anatomic conditions within the orbits in growing children favors the tendency to divergence, and may reduce a convergent squint or cause it to disappear spontaneously. I never saw a spontaneous diminution of permanent divergent squint, but very often the contrary—that is, a gradual increase of the divergence—while a periodic squint which the patient can overcome voluntarily may become manifest

less frequently if a delicate child gradually becomes stronger or an existing aniseikonia, which may interfere with fusion, has been corrected. But the divergent position of rest will always remain the same, or will even be found to have increased as compared with the divergence determined previously. The visual act, with regard to the relations between the two retinae, is very interesting, particularly in cases in which the divergence is temporarily latent. While perfect binocular vision with depth perception and fusional amplitude might be found during the latent period, not only will diplopia be absent during the periods of manifest squint, due to suppression of the images of the squinting eye, but if double images are produced by one of the aforementioned methods they will not be crossed but show a behavior pointing to an anomalous retinal correspondence adapted approximately to the divergent position of the eyes. A strong prism, base in, for instance, will produce homonymous double images with the same separation as in cases of orthophoria, or if a vertical prism is used the double images will be seen one above the other without, or with a very slight, lateral displacement. In the afterimage test the two images will not form a cross, but the afterimages belonging to the right eye will be seen, as a rule, displaced more or less to the right of the center of the left afterimage. Such patients make alternate use of the normal and the anomalous mode of localization, according as to whether the divergence is kept latent by the compensating innervation or is manifest. In most cases of permanent di-

* From The Dartmouth Eye Institute, Dartmouth Medical School. Read before the Seventh Annual Mid-Winter Clinical Course of the Research Study Club, Los Angeles, California, January, 1938.

vergent squint an anomalous correspondence will be found, but in these cases there also prevails an alternating uniocular vision with strong suppression of the retinal images of the squinting eye. Here the phenomenon of horror fusionis occurs even more frequently than it does in convergent squint and must be looked for in every case of alternating divergent squint. After the angle of squint has been reduced by operation, the patient will have a more or less disturbing homonymous diplopia, either transient, if the abnormal correspondence is superseded by the normal one, or persisting in some cases for a longer period until suppression of the retinal images of the squinting eye returns or binocular single vision is restored. Since divergent strabismus, in most cases, is based on anatomico-mechanical conditions, refractive errors not playing any important part in the etiology, the patient cannot derive much profit from glasses, apart from the equalization of the vision by the correction of a possible anisometropia or aniseikonia, and facilitation of binocular fixation of near objects by the correction of any myopia. In cases of hyperopia, correcting glasses may, indeed, increase the divergence but, of course, one would not deprive such people of the comfort of correcting glasses on account of the unimportant increase of the angle of squint. As to the question of the age at which children with divergent squint can be operated on, one must consider the fact that divergence frequently increases during the growing period so that a good result obtained by an operation in early childhood will be gradually diminished. I have seen patients with divergent squint that had been removed completely by operation when they were six years old; six years later the same amount of squint had returned and they had to undergo another operation. Therefore, I prefer to operate on children with divergent squint not

prior to the twelfth year, if the permanent squint is not of a very high degree and both eyes have equally good vision. In the meantime fusion exercises may be given to all patients capable of overcoming the deviation temporarily. In a permanent squint these exercises are of no use.

Permanent *vertical* squint of a purely concomitant type is a very rare affection. In the great majority of cases the hyperphoria becomes manifest temporarily, inducing the patient to consult the doctor on account of the diplopia or the disfigurement. Considering the various types of vertical deviations discussed previously, a very careful examination is indispensable in order to find out to which of the different groups the individual case belongs. One will recognize the deviation as belonging to the concomitant type only if there are no signs and symptoms of a paretic origin or of the so-called overfunction of the inferior oblique muscles. This may be easily ascertained by examining the double images in the whole field of fixation with the red glass successively before the right and left eye. If there is neither a definite increase, respectively decrease of the vertical deviations, nor a conclination, respectively disclination of the corresponding retinal meridians in any part of the field of fixation, a concomitant hyperphoria may be taken for granted. Spontaneous diplopia is frequently absent, or will be noticed only occasionally if the fusion tendency is strong enough to overcome the anomalous position of the eyes temporarily. In the latter case subjective troubles, such as eyestrain, headaches, and other conditions, may occur. They are due to the effort to produce and maintain the compensating vertical deviation innervation. As to the amount of hyperphoria or periodic hypertropia which may cause these troubles, there is no regularity. I know patients with a high amount of vertical deviation who have no subjective trou-

bles, and others who had suffered very much in spite of the insignificance of the deviation. The difference in reaction is due to differences in the general, particularly the nervous, condition. Suppression and anomalous retinal correspondence develop, as a rule, in the rare cases of a permanent, protracted vertical squint. Very frequently a vertical deviation of the concomitant type is combined with convergent and divergent squint. In cases in which, according to an anomalous correspondence, the afterimages show a vertical in addition to the lateral displacement, both components may coincide approximately with the objective angle of squint. Spontaneous decrease or disappearance of vertical deviations of a non-paretic type does not occur, so that operative procedures may be considered at any time provided that the deviation exceeds 5 (arc) degrees. Smaller deviations may require prisms that remove the subjective troubles in most cases.

True concomitant cyclotropias of such an amount as to require attention occur very seldom, whereas meridional declinations of paretic origin play an important part in the diagnosis and therapy of ocular paralyses.

As to the operative procedures in the various types of squint, I am not going to discuss the various operations on the muscles of the eye. But I should like to say a few words about my guiding principles for operations for strengthening and weakening the eye muscles. Strengthening can be effected either by an advancement or by a shortening operation. Personally, I prefer a combination of advancement with resection of a larger or smaller portion of the tendon according to the amount and the degree of deviation. In no case is it certain how many degrees of deviation will be corrected definitely by an advancement or shortening operation. The results obtained by identical operations in similar cases differ

within wide limits. Claude Worth, though admitting that it is impossible to estimate beforehand the results that will be obtained by operation, has maintained, in his well-known monograph on squint, that the immediate effect of his advancement operation is also the permanent result and that, therefore, no overcorrection is necessary. On this point I do not agree with Worth. The immediate effect of advancement, as well as of every shortening method, diminishes in the course of time, and I have always been satisfied if I obtained a considerable overcorrection as an immediate result of operation.

In my opinion it is wrong to refuse, as a matter of principle, to perform the muscle-weakening operations. The contrary opinion is based on the assertion that the effect of such operations is always incalculable and always produces a form of paralysis of the weakened muscle. Reference is made, further, to the disfigurement due to the postoperative exophthalmos and the recession of the caruncle. Indeed, these considerations are true enough for a simple tenotomy, but not for a recession operation safeguarded by a suture by which the separated tendon is prevented from receding farther than is desirable. Only in certain cases is it necessary to insert the suture into the sclera. I prefer, as a rule, to pass one needle of the double-armed suture through the tendon before I cut it, and then through the peripheral edge of the divided conjunctiva; the other needle is passed through the conjunctiva near the corneal margin. Then I make a loose loop of the ligature, which can be tightened or loosened still further, or removed on the following day, according to circumstances. I am thus able to modify the result to a certain degree, in any case preventing an undesirable overcorrection and cosmetic disfigurement. To the advocates of advancement and shortening operations, one might say that if the cor-

rection of a deviation is to be obtained in every case and solely by these operations, disadvantages almost as unwelcome as those that are imputed to the weakening operations must often be anticipated. The enophthalmos resulting from an excessive advancement, being always associated with the narrowing of the palpebral fissure, causes a cosmetic disfigurement as unsightly as the exophthalmos and the receding of the caruncle following an unguarded tenotomy. Moreover, excessive advancement of a muscle will restrict the function of its antagonist as much as an unguarded tenotomy of the latter.

In the vast majority of cases of convergent squint the inward movement is increased considerably without a corresponding diminution of the outward movement taking place. I do not see any reason for rejecting a recession of one or both of the internal recti in order to weaken their excessive functioning. Of course, one must take care through safeguarding sutures, that the weakened muscle retains a normal function. I have never seen a secondary divergent squint develop after a safeguarded recession in any of my cases of convergent squint, most of which I was able to follow up for several years after the operation. In cases of alternating squint I prefer to divide the operative effect between both eyes. There must be, as a rule, an interval of at least one month between the first and second operations, or better still, of several months, so that one may judge the definite result of the single operation. Always bearing in mind the highest principle of the physician—“*nil nocere*”—one should never be misled in the face of a seemingly inadequate effect of the recession, into increasing it at the risk of an excessive weakening of the muscle, except in cases of high amblyopia of the squinting eye, if there are reasons for leaving the other eye untouched. If the

result of a properly regulated recession of both the internal muscles is insufficient, an advancement or shortening of the external recti must be considered. In unilateral strabismus with monocular amblyopia and a high degree of squint, one would better operate on this eye in order to avoid an habitual turning of the head, which may occur after the internal rectus of the fixating eye has been weakened or the external rectus shortened or advanced. If the angle of squint is more than 20 degrees a recession of the internal rectus has to be combined with an advancement or shortening of the external rectus because an exaggerated recession as well as advancement may cause a disfiguring monocular exophthalmos or enophthalmos. In adults the risk of obtaining an overeffect—that is, a secondary divergence—by an adequate operation, is relatively small.

One should not aim, in any case of convergent squint, to achieve parallelism of the visual lines as an immediate result of the operation, since one would run the risk of a gradually developing secondary divergence. A small deviation of about 5 degrees of convergence must be left, particularly if the patients are very young children, since a spontaneous decrease of the convergence has to be taken into account. If the restoration of binocular single vision is obtainable at all, the fusion tendency would easily overcome the small amount of squint that has remained. If the inward movement of the eyes is not increased, one must advise against a weakening of the internal recti. Of the operations aiming at strengthening of the external recti, the O'Connor cinch operation may be preferable, particularly in cases of young children with a small angle of squint, because it can be better graded than the other shortening and advancing methods.

In divergent strabismus, the inward movement of the eyes is, as a rule, re-

stricted, without a perceptible increase of the outward movement. Excessive abduction will be found only exceptionally in cases of an extremely high deviation. Therefore the operative procedures must aim, first of all, at the strengthening of the weak internal recti muscles. If the angle of squint amounts to 20 degrees or more, an advancement and a shortening of both internal recti may be performed simultaneously, combined, if necessary, with a temporary severing of one or both the tendons of the external recti, with securing sutures to prevent receding. An ordinary recession of the external recti has, as a rule, no lasting effect, and if no excessive function of the external rectus exists, involves the risk of producing a parietic condition so that, apart from not achieving a sufficient reduction of the divergence in the primary position of the eyes, homonymous diplopia may occur when looking toward the side on which the weakened muscle has to act. Considering the fact that the immediate effect obtained by an advancement or shortening operation will decrease gradually, one must endeavor to obtain an overcorrection—that is, a certain amount of convergence—as the immediate result of one of these operations. There is no danger that the overeffect would remain permanently if it is to be obtained solely by strengthening the internal recti. The greater the original divergence may be, the greater ought to be the convergence produced as the immediate result of the strengthening operation. For instance, if the divergence were 20 degrees, an overcorrection up to 10 degrees would give approximate parallelism after the sutures had been removed. If a recession of one or both external recti were to be combined with the advancement or shortening of the internal recti, no overeffect, or at most a very small one, must be the goal.

There are cases of divergent strabis-

mus, fortunately rare, which baffle the doctor in spite of the greatest care and experience as to indication, and the greatest skill as to operative technique. I remember some such cases. One of them was of a five-year-old boy with a divergence of 30 degrees, a moderate hyperopia, and two-thirds vision in each eye; adduction was somewhat deficient, abduction not increased. After advancement of both internal recti, combined with recession of both external recti, there still remained a divergence of 20 degrees. Three years later advancement of both internal recti was repeated, both eyes being kept bandaged for eight days. The divergence was reduced to 12 degrees, which increased to 26 degrees within the next month. As adduction was still deficient, the internal recti were again advanced and shortened. In addition to the ordinary sutures, auxiliary double-armed needles were passed through the body of the muscles and fastened beyond the vertical meridian both above and below. The stitches all held and the immediate effect was all that could be desired, but divergence developed again gradually and increased to 30 degrees within three months. Assuming that this quite unusual behavior was due to a congenital anomaly, perhaps elastic bands which gave way for a while to the stronger action of the advanced and shortened muscles but which later overcame their resistance, I searched in vain for such a condition during the last operation. The etiology could not be cleared up apart from the statement, which seemed to support our supposition of a congenital anatomic anomaly, that the patient's brother was idiotic and had a convergent strabismus and congenital cataract.

That the best possible cosmetic result can be spoiled by the lack of fusion power, causing diplopia after the deviation had been removed, proves true also

in cases of divergent squint. A very important hindrance to the cure is sometimes produced by a neuropathic condition. Even if there is no true horror fusionis, the patient being able to fuse stereoscopic pictures, the fusional amplitude is nil, so that a residue of 1 or 2 degrees of the previous deviation produces intolerable diplopia, headaches, and so forth. In some of my cases of this type an antineuralgic medicament removing the headache caused the diplopia to disappear for several months. This and similar observations cannot be explained but by the assumption that in such cases both headaches and diplopia are symptoms of the same neurological process, or else the patient's general resistance may be so affected by the headaches that there is no longer sufficient energy to produce and maintain the adequate innervations of the oculomotor apparatus. That in such cases with a weak fusion faculty dissociated vertical-divergence innervations not infrequently also cause trouble and render the restoration of binocular single vision more difficult will be discussed later. Finally, there are cases in which divergence is not based on an anomalous position of rest, but is caused by an excessive divergence innervation, which will be discussed together with the other deviations of spastic origin.

Operative procedures in cases of true concomitant *vertical* deviations which do not show perceptible changes in the different parts of the field of fixation, are not frequent. They have to be considered in cases in which the squint amounts to more than 5 degrees. If, due to a monocular amblyopia, only the cosmetic disfigurement must be removed, one will retroplace the superior or inferior rectus of the weak eye as the case may require. If both eyes have fairly equal vision so that it is possible to obtain binocular single vision, one should operate on the eye that is deviated upward relative to

the other, considering that a slight restriction of the upward movement is not so important as a restriction of the downward movement of the eye operated upon. The eyes are used in the elevated position only rarely, so that a slight inequality of the upward movement, due to a possible postoperative insufficiency of one superior rectus, will hardly cause trouble, there being all the more reason not to, because when looking up the head is always moved in the same direction, whereby the eye movement is reduced to a minimum. Insufficiency of one of the depressor muscles, is, on the contrary, as a rule very annoying, since the eyes work mostly in a more or less lowered position and a compensatory habitual lowering of the head causes discomfort. Whether or not the superior rectus shall be weakened by a recession, or the inferior rectus strengthened in order to correct an upward deviation, will depend on the extension of the field of fixation. If it is considerably enlarged in the upper half without being narrowed correspondingly in the lower half, the superior rectus may be retroplaced with a safeguarding suture permitting a regulation of the effect, if necessary, the day after the operation. If the enlargement of the upper half and the restriction of the lower half of the field of fixation are approximately balanced, it is to a certain degree irrelevant which of the aforementioned operative procedures is selected.

The recession of the superior rectus can be graduated and regulated more easily than most of the advancement and shortening methods which may be considered for the strengthening of the function of the inferior rectus. I should think that of those methods the O'Connor cinch operation would permit the best subsequent regulation of the effect. Besides, this method would prevent a meridional declination (torsion) which might possibly produce an annoying

diplopia. The sensitivity to torsional deviation varies in the individual patients. However, as the rotating component of the vertical recti muscles is much weaker than that of the oblique muscles, a carefully safeguarded recession of the superior rectus does not, as a rule, cause any trouble. At any rate, in all cases in which vertical deviations are to be corrected by operation one must consider individual peculiarities, which may be difficult, if not impossible, to know beforehand. Such peculiarities may be illustrated by the following examples.

A man, 36 years of age, had been suffering with headaches and unsteady vision, especially in the street. He noticed diplopia occasionally after fatigue. Prisms gave relief only at times. When binocular vision was prevented, there was a deviation of the right eye downward; that is, a negative vertical deviation, gradually increasing to 9 degrees. Upon changing the visual direction, the negative vertical deviation varied a little, but the differences were slight and not constant for the same direction. Both eyes had vision of $\frac{6}{4}$ with $+1.0$. As the patient had previously worn prisms without any effect, I made a recession of the left superior rectus; the immediate result was an overeffect; namely, 10 degrees plus vertical deviation. By tying the safeguarding sutures, which were removed after four days, the plus vertical deviation was reduced to 1 to 2 degrees. But the sixth day it had increased to 8 degrees and the diplopia was very annoying. On the tenth day there were 9 degrees plus vertical deviation and 10 degrees convergence. The only thing that could be done was to advance the left superior rectus. Result: slight negative vertical deviation which had disappeared a week later. The patient felt very comfortable. A few days later he reported that upon awakening he noticed diplopia, which disappeared again, but he felt as

though his head were being compressed. Upon examination a negative vertical deviation was found, which increased to 7 degrees. After a month's vacation he reported that he felt decidedly better; he noticed diplopia only momentarily upon awakening. Examination showed scarcely one-half degree plus vertical deviation. During the next three months a latent plus vertical deviation of one-half to 2 degrees was always present. The patient complained only of occasional diplopia. The last examination showed $1\frac{1}{2}$ degrees negative vertical deviation, and convergence 4 to 5 degrees. Stereoscopic exercises for two weeks caused the diplopia to disappear. Headaches occurred only after prolonged reading. The neuropathic character of the ailment was evident from the way in which the patient, a strong, healthy-looking man, described it. He spoke now of a feeling of compression, then of a feeling of sand in the eyes, again of a blind feeling, a dazed state, as though he had been drinking too much, then again as if the brain were too loose, and so on. The course of the treatment also allowed drawing the conclusion that the vertical divergence was greatly influenced, if not directly caused, by abnormal innervations which could not be anticipated from the outset in the face of a fairly constant deviation pointing to an anomalous position of rest as the main, if not the only cause of the vertical divergence.

After an ordinary strabismus operation, it is usual for the tendon to be so well fixed five days after the operation that the safeguarding suture can be removed without fear of any appreciable change in the position of the eyes. Here the plus vertical deviation increased from 1 or 2 degrees to 9 degrees and a convergence appeared that had not been observed before. Still more strange was the appearance of an operative overeffect of 7 degrees 11 days after the advancement

had brought about balance, whereas usually the effect of an advancement operation gradually decreases during the first and second week after the operation. The overeffect in my patient's case also disappeared finally and was not noticed during the next five months.

In such cases, we are dealing with a fusion power of varying strength, depending upon the existing physical and psychic condition. To this is added abnormal stimulation of the vertical deviation centers, the origin of which is understood no more than that of other neuroses.

Another patient, 27 years of age, with an inherited neuropathic constitution, complained of eyestrain, headache, dizziness. The trouble had increased gradually to such a degree that he was unable to work and was very much worried about his future. A careful examination showed a right hyperphoria with all the characteristics of a typical concomitant deviation. A very strong fusion power kept the right hyperphoria of 15 (arc) degrees almost continually latent and it took a long time to manifest it by relaxation of the compensating negative vertical deviation innervation. A recession of the right superior rectus produced a good effect which, however, gradually disappeared, so that a right hyperphoria of almost 15 degrees still remained. Since there was also a slight meridional disclination, I decided to make a retroplacement of the left inferior rectus in order to restore the parallelism of the corresponding meridians. Again, the immediate result was satisfactory since the right hyperphoria was reduced to zero, but after five days the patient showed a *left* hyperphoria of 12 degrees, nearly the same degree to which the original opposite deviation had amounted. I could not understand what had caused this undesired overeffect, since I had taken all the necessary precautionary measures,

and it could indeed be proved that neither a wrong indication nor a faulty operative technique was to blame. There existed not a minimum of negative vertical deviation (*left* hyperphoria) during a bilateral occlusion of the eyes for a whole week; sometimes there was present even a small fraction of the original plus vertical deviation. Further, it was ascertained during a long period of observation, that when one eye was occluded or the fusion broken by a dark-red glass, at first the *left* hyperphoria became manifest and increased gradually, but after a while it decreased to zero. I cannot discuss in greater detail all the very interesting phenomena which I was able to control during a period of eight years. They are to be found in my article on the operative treatment of vertical deviations in Graefe's Archiv, 1921. Finally, the diplopia disappeared and the patient was happy and able to work. To explain the quite unusual behavior of the vertical deviation and the unexpected reaction to the operative procedure, one must take into account that, to overcome the high amount of the primary right hyperphoria a permanent excessive negative vertical deviation innervation was required and maintained by the very strong fusion power. It would seem therefore, that due to the long-standing excessive innervation an abnormal excitability of the negative vertical deviation center had *remained*, notwithstanding that it was no longer wanted after the operative correction of the positive vertical deviation. Though absent while both eyes were bandaged, this abnormal vertical deviation innervation arose as soon as the eyes were opened and the patient looked about. Whether this hypothesis is right or wrong I do not know, but I cannot think of a better one. In the first place, the neuropathic constitution was, of course, responsible for the peculiar fluctuations of the vertical deviation. The

good ultimate result supports the assumption of the nervous basis.

The vertical deviation is frequently combined with a convergent or divergent strabismus. Whether, in such cases, the lateral or the vertical deviation must be considered as the primary anomaly will not be discussed at present. If, after the removal of the greater deviation component, the fusion apparatus were not able to overcome the smaller component, a second operation would have to deal with it. In some of these cases

one may succeed in the attempt to remove both the lateral and the smaller vertical deviation by one operation. This may be attained if the lateral rectus muscles are not only advanced or retro-placed in the direction of their course—that is, in the horizontal direction—but are at the same time displaced above or below the horizontal meridian according as to whether an improvement in the function of the elevator or of the depressor muscles is desirable.

SOME PHYSIOLOGICAL AND ANATOMICAL ASPECTS OF THE CORNEA AFFECTING ITS PATHOLOGY*

THEODORE L. TERRY, M.D.

Boston

The cornea is relatively immune to the ravages of certain diffuse diseases such as early secondary syphilis, probably due to its simplicity and especially its lack of vascularity. On the other hand, it may be more liable to invasion by other disease processes. Lack of vascularity favors "sluggish, chronic, and somewhat intractable" pathological processes.¹ The cornea shares general bodily immunity only to a slight degree² and weak general bodily immunity can be acquired through corneal inoculation.³ The number of different pathological processes to be found in the cornea are limited, but variation in location and combination of these lesions give rise to the surprisingly large number of variants in the appearance of corneal diseases. Changes too minute to be observed in the skin would be more obvious in the transparent cornea.¹ Biomicroscopy has given much information concerning the pathological processes, yet the correlation of changes seen by means of the corneal microscope with known pathological

processes is far from complete, the exact pathology of many of the corneal diseases not being known.

A plea has been made for standardization of abbreviations used on ophthalmological records.⁴ Abbreviations for the anatomical structures of the cornea are also useful. The layers can be indicated by letters in alphabetic order, as follows:

- A Anterior epithelium
- B Bowman's membrane
- C Corpuscular layer (substantia propria)
- D Descemet's membrane
- E Endothelium (so-called)**

The epithelium of the cornea in the healthy state is relatively impervious to water, certain drugs, vital stains, and most bacterial toxins (toxins from gonococcus and corynebacterium, diphtheria excepted¹). For purposes of metabolism the epithelium passes oxygen into the cornea⁵ and carbon dioxide out.⁶ In fact, the term respiration is applied to this process.⁷

The mesenchymal epithelium or the so-

*From the Massachusetts Eye and Ear Infirmary, Harvard Medical School. Read before the New England Ophthalmological Society, March 15, 1938.

**No suggestion to change the names of the corneal layers is intended.

called endothelium of the cornea allows the passage of toxins in each direction. Toxic iritis often results from ulcerative keratitis, and ring abscess of the cornea may at times result from virulent endophthalmitis. The endothelium is also permeated by certain drugs. However, in its healthy state the endothelium, like the epithelium, is relatively impervious to water. Should either epithelium or endothelium be injured, water passes freely, giving rise to swelling of the substantia propria due to its turgescence and to edema of the cornea with subepithelial-vesicle formation.

The cells of the epithelium are bound together firmly not only by the intercellular cement substance and by protoplasmic continuity but also by the so-called tonofibers.⁸ No doubt, the interepithelial nerve fibers also support the epithelium as well as prevent side slipping of the layer. The cells appear to be bound to each other more firmly than they are bound to Bowman's membrane, since spaces between the cells are much less common than spaces between the cell layer and Bowman's membrane in edema of the cornea.

The temperature of the cornea is relatively low, the difference between cornea and iris temperature in the rabbit even reaching 5°C.⁹ The cornea can survive a temperature of -2°C. for 10 days.¹⁰ The lack of activity and the lower temperature of the cornea indicate that a very small amount of nutrition and oxygen must be required by the cornea normally. The nutrition can be derived from the limbus vessels, the aqueous, and the tears. In a healthy eye, the transparency of the cornea is not affected by filling the anterior chamber with air, thereby removing all contact with aqueous.¹¹ It is obvious, therefore, that the cornea can get sufficient nutrition from the tears and limbus vessels. The cornea does not suffer from lack of nutrition following a complete

peritomy,¹² following section of three fifths the corneal circumference,¹³ or following complete corneal grafts.¹⁴ It appears, then, that the cornea can get sufficient nutrition from the aqueous and the tears. The chemical analysis of tears indicates that sufficient protein, carbohydrate, and fat are present to be of nutritional value.

TABLE 1
NUTRIENT MATERIAL IN AQUEOUS AND TEARS¹⁵

	Protein	Quantities gram % Carbohy- drate	Fat
Aqueous Duke-Elder	.0269	.0983	.004
Tears	Ridley- Brown .669	Ridley- Brown .65	Mucus and Fat Fiericks .30

Epithelium at times may grow over necrotic corneal tissue or over fibrin and exudate. Nutrition for this epithelium seems to be from tears. Nutrition for growth of filaments in true filamentary keratitis seems to be from the tears also, although tears are scanty in true filamentary keratitis.¹⁶ Finally, absence of tears results in disturbances of the cornea of a type somewhat specific and different from drying alone.^{16, 17} The tears alone cannot furnish corneal nutrition. Wagenmann¹⁸ has shown that the cornea degenerates following loss of nutrition from the aqueous and the limbus vessels after the long ciliary arteries and most of the short ciliary arteries have been cut off. In stagnation of the aqueous, as met in long-standing glaucoma and chronic uveitis, nutritional disturbance of the cornea gives rise to degenerative pannus formation. Accumulation of toxins in the stagnant aqueous alone may account for the change, but sclerosis of vessels at the limbus may be a contributing factor.

The importance of nerve supply for

maintenance of a normal corneal condition is evidenced by the occurrence of neuro-paralytic keratitis following Gasserian-ganglion surgery. At the present time, this is explained most satisfactorily by loss of antidromic nerve impulses.¹⁹

CONCLUSIONS

1. It is suggested that the letters A, B, C, D, and E be used as standard abbreviations for the anterior corneal epithelium, Bowman's membrane, substantia propria

(corpuscular layer), Descemet's membrane, and so-called endothelium of the cornea.

2. The interepithelial nerve fibers tend to bind the epithelial cells together.

3. The cornea may derive some nutrition from tears as well as from limbus vessels and the aqueous.

4. Stagnation of aqueous is present and is probably an important factor in the production of the degenerative pannus.

128 Newbury Street.

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MONOCULAR PROTECTION VERSUS MONOCULAR OCCLUSION

WILLIAM H. HOWARD, M.D.

Chicago

In the past year, several patients under my care have worn tinted transparent eyeshields. These patients may be divided into two groups: The first group consisted of one patient with laceration of the bulbar conjunctiva of the right eye, another with caterpillar keratitis, and the remainder were patients in which an imbedded foreign body had been removed from the cornea. In these cases satisfac-



Fig. 1 (Howard). Eyeshield with closed slit on each side.

tion was consistently reported. A second group consisted of patients who had either moderate or excessive tearing. One of these had a deep burn of the outer lower palpebral conjunctiva caused by hot metal. The others had acute catarrhal conjunctivitis. In this group the accumulation of moisture on the shield interfered with vision and presented a special problem, which will be discussed later. The final reports in both groups were in favorable contrast to the comments of patients who wore the complete-occlusion type of eyeshield.

In the new eyeshields that have been made a transparent green-colored material called Fibestos¹ is used. This is a

slow-burning material of the celluloid group. (I am given to understand that a noninflammable material will soon be marketed.) The shield² (fig. 1) has a small slit on each side. Other forms of construction will be tried.

PRINCIPLES OF THE NEW EYESHIELD

The ideal eye shield should possess the following characteristics: 1. It should be transparent; it may be clear or tinted depending upon its use. 2. The center-piece should be regular in curvature and be made of a relatively uniform refractive medium. 3. Its front piece should be convex in order to be free of the lids and the eyelashes and to allow for a moderate amount of cotton to be placed within when necessary. 4. It should be designed to fit the contour of the average orbit. 5. It should be made with two ties for proper fitting and adjusting. Note: a frequent cause of blepharospasm is the irritation to the eye lashes or lid margins due to improper adjustment of the eyeshield. 6. It should be aseptic and protected against contamination. 7. It should be light in weight. 8. It should be noninflammable. 9. It should be inexpensive.

When properly used, certain advantages are noted in this type of shield over the complete-occlusion type. With vision in both eyes instead of in only one, the patient is less incapacitated for both work and play. There is less nervous tension in the covered eye as well as in the uncovered eye. The new shield presents a better appearance than the complete-occlusion type. In the unusual case of the patient with loss of vision in one eye it allows the wearing of a shield over the good eye.

Advantages in therapy are anticipated. Any final determination, however, that it

shortens the time of eye inflammation or lessens complications or sequelae must await a longer period of study and more accurate data. So far the new shield has not been used in the usual postoperative case. Its efficiency in certain stages of postoperative care seems plausible. When protection from light is not needed the use of the clear shield more nearly allows normal binocular vision than that allowed by the tinted type. However the usual requirements are for light protection. Occlusion of one eye in the treatment of amblyopia, in the temporary treatment of diplopia, and in taking fields obviously requires complete occlusion.

CASE REPORT (GROUP 1)

Mr. J. M., aged 55 years, on August 12, 1937, while employed as a millwright in a grain elevator, was struck in the right eye by a small iron bar. At the time he was not wearing glasses. His distance vision had always been good. In late years with reading glasses his near vision had been satisfactory. Other history was of no importance.

Examination (one hour after accident): R.V. 1. -3, L.V. 1. -4; with +2.00 D. add., each eye—J.1 at 14". There was a one-half inch vertical laceration of the right bulbar conjunctiva, 7 mm. medially from the corneoscleral junction. The adjacent conjunctiva was hyperemic. Except for a moderate retinal arteriosclerosis, the findings were otherwise negative. After the wound healed, the patient did not return for retinoscopy and phoria tests.

Treatment and progress: Under asepsis the conjunctiva was sutured with black silk. One drop of 1-percent atropine was instilled on the first day only. For three days 1-percent yellow oxide of mercury ointment was used, and the eye was bandaged. During this time there was the usual traumatic reaction; that is, the conjunctiva was injected and swollen. On the

fourth day, the patient returned to work wearing the complete-occlusion type of shield. Oxycyanide of mercury 1:5000 was given for home use. The condition improved steadily. On the seventh day, the sutures were removed and the following day a transparent shield replaced the old shield. This was worn continuously for three days and because of the presence of grain dust in his place of employment it was worn at irregular intervals for another week. After wearing this shield for 24 hours he stated that his eyes felt a great deal more relaxed. The relative objective findings on this day were not definite but the eyelids appeared more relaxed and the tissues less congested. The patient later stated that the shield was moderately comfortable and only caused a slight interference with his work.

Results: The wound healed without any complications. A thin scar remains and the vision was unchanged.

SPECIAL PROBLEM OF GROUP 2

In the presence of free lacrimation (from whatever cause) or excessive perspiration, with the additional factors of humidity and atmospheric-temperature variations, the inner front piece of the shield becomes clouded with fine or coarse moisture. This disturbs proper vision and one may be forced to pad the shield with cotton.

By making a few openings in the shield, allowing ventilation, this difficulty was overcome so that the shield was worn with comfort. In these cases a circular aperture 6 mm. in diameter was made with an inexpensive hand punch in mid line about one-half inch from the lower edge of the shield. One was made over the region of the inner canthus, and the last over the external canthus. The part of the shield selected for each aperture must be elevated from the skin.

The possible danger of secondary infection in using the ventilating shield must be considered, consequently discretion is necessary in the choice of eye cases and the environment in which its use is allowed. However, in a reasonably clean atmosphere this danger appears to be reduced rather than increased. The small number of cases in which ventilation has been used seem to have responded more favorably to treatment than usual.

This was particularly noticeable in the case of ocular burn mentioned, in which the healing time seemed considerably shortened and the succulent edematous appearance of the tissues disappeared on the first day that the new treatment was instituted (third day after the burn).

In considering this principle of treatment one may reason that the real source of danger is the stagnant pool of secretion, while free lacrimation and later relative dryness both discourage bacterial invasion.

When purulent secretion is present a cotton pad should be used, likewise in those cases in which there is visual obstruction from moisture and an unfavorable environment the use of the ventilating shield is inadvisable. Both of these conditions frequently exist for only a part of the time while the patient is under care.

A loose pledget of cotton or a piece of gauze over the lower opening of the shield may be used as an air filter in some cases.

PHYSIOLOGY

The primary objective of the lid muscles is for preservation of the eyeball. Opening the lids to allow vision should be considered secondary. This protective action is two-fold in purpose. It closes the lids, forming a shield, and it distributes the lacrimal secretion over the delicate anterior tissues of the eyeball.

Bell³ in his classical essay of 1823, showed that this protective mechanism of

lid closure is supported by a special action of certain ocular muscles: briefly, in sleep and certain other occasions the lids are incompletely closed, the eyeball is rolled upward and outward, thereby improving the position for the two-fold protective action. The lid closure is brought about by the palpebral portion of the orbicularis oculi muscle. This muscle is highly sensitive and has a low chronaxie of 0.20 to 0.36 sigma (Bourguignon⁴). The second part of this phenomenon is due to the action of the superior rectus muscle. The sensitiveness of this composite action has been described by Miles,⁵ who in his experimental work has demonstrated the efficient manner in which the eyeballs turn upward regularly even in winking. He states that the results were practically the same for binocular or monocular closure. An important consideration is that while these two actions are associative the turning of the eyeball depends upon the primary action of lid closure.

In the establishment of the artificial condition of monocular occlusion there is an immediate variable loss of vision. The amount of this depends upon the percentage of vision in each eye, and also upon which eye is covered. Most patients find some difficulty in monocular vision, and the decrease in sharpness of vision discourages any prolonged attempt at close work, especially reading. Where vision is forced in this condition it is logical that the ciliary muscle undergoes a strain. The change from the binocular field to that of the monocular type is not an important factor in causing muscle strain.

With monocular occlusion, the heterophoric eye will not react in the same way as does the orthophoric eye. The manner and degree of this difference will depend upon the amount of heterophoria and upon which type of phoria is present; that is, esophoria, exophoria, or hyperphoria. Bielschowsky⁶ states that orthophoria is

the exception, that at least 80 percent of eyes are heterophoric. Marlow⁷ reports an even greater figure.

With monocular occlusion in heterophoria certain changes in the position of the eyeball and extraocular muscles take place immediately. Marlow⁸ has shown that the relaxation of heterophoric muscles under monocular occlusion at first is incomplete. Effort towards convergence in this early stage must throw an added burden on the individual heterophoric muscle. Increased muscle action occurs in a mild degree also in the remaining extraocular muscles because of the necessary readjustment. It is only when the stage of decompensation is reached that these conditions practically no longer exist. This is the time when the fusion tendency reaches its lowest limits.

A different phase of this problem relates to the lid muscles working in association with the vertical muscles of the eyeball. Certain innervational influences are present in the eye that is actively fixating. The action of the levator palpebrae superioris elevates the eyelid. Besides convergence and accommodation the entire musculature is in tone, and the eye is in constant albeit imperceptible motion. Adler and Fliegelman⁹ have shown that in fixation there is continual motion and that fatigue and lag of attention cause an increase in the rapid shifts. We may presume that this latter stage is frequently the transitional period before physiologic rest.

In the inattentive eye the absence of fixation relaxes the muscles of accommodation and convergence and the eyeball has a tendency further to relax to the position of rest. Adler,¹⁰ states that when a person is fatigued the tone of the lid muscle innervated by the sympathetic system is depressed and the palpebral fissure becomes narrower. That a similar condition due to monocular occlusion is experi-

enced when local fatigue sets in it is reasonable to assume. It is then that the lids frequently blink and that innervation for lid closure increases. Associated with this is the innervation effecting the upward turning of the eye at each incomplete closure.

With monocular occlusion a conflict between these two innervational forces frequently exists. The extent to which this influence is felt must depend upon the relative amount of these special innervations to either eye. It is probably greatest when that stage is reached in which the two separate innervations are comparatively equal.

It is this conflict that creates a muscular imbalance and brings about excessive innervation to the lids, resulting in tremor and later blepharospasm.

In my opinion this tremor and blepharospasm acting through Bell's phenomenon are frequently productive of so-called functional hyperphoria, in which cases it may be associated with true latent hyperphoria.

An understanding of this muscular tremor may be had by establishing a vertical diplopia with prisms. This is done by increasing the strength of the prisms just beyond the point of duction; then, with a partial contraction of the lids of one eye, the light will be seen to waver. A coarse fluctuation will first be noted by the eye with the partially closed lids. In a short time a fine fluctuation is frequently noted in the other eye.

Of additional interest is the anatomic relationship.¹¹ The levator palpebrae superioris inserts its stronger posterior lamella into the upper margin of the superior tarsus and attaches itself to the conjunctiva.

With this fact in mind we may reason that the presence of blepharospasm in an injured or diseased eye will cause increased conjunctival congestion.

Certain branches of the ophthalmic artery supply the extraocular muscles. These end as anterior ciliary arteries. The corresponding veins empty into the veins of the extraocular muscles. Again, in the pathological eye an increased innervation of any of these muscles might be presumed to aggravate the congestion already present.

SUMMARY

The conclusion drawn from a rather brief empiric study favors the use of the properly made transparent shield over the type of shield that produces complete monocular occlusion. This conclusion is apparently supported by certain physiological findings.

The new shield is used unchanged, provided with ventilation and with cotton padding. The ventilating shield should be used only in a favorable environment and for the suitable type of case. Otherwise, the amount and character of secretion determine the choice.

When properly used certain advantages

are noted in the new type of eye shield. The wearer will have vision in both eyes, thereby allowing a reduction of incapacity in occupational activity and in recreation. It reduces both local and general nervous tension. A better appearance is noted.

In the hyperemic eye, a certain amount of nervous and muscular irritation already exists. Anything which induces nervous tension in the inflamed eye would increase the engorgement in the conjunctival and adjacent tissues.

One of the fundamental therapeutic principles is that rest is necessary to promote the healing of diseased or injured tissues. While complete rest is not always possible, in those cases where only an eye shield is indicated, a greater degree of relaxation is obtained by allowing vision. By properly using a transparent eye shield, one accomplishes this and still gives the necessary protection to the eye.

The effects of monocular occlusion are presented.

2376 East Seventy-first Street.

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SUPERFICIAL MARGINAL KERATITIS

CLINICAL AND ANATOMIC FINDINGS IN FELLOW EYES*

O. H. ELLIS, M.D.

Saint Louis

Superficial marginal keratitis, according to Isakowitz,¹ was first described in 1881 by Arlt. In his "Textbook of ophthalmology," E. Fuchs,² in 1895, gave a full discussion of the signs and symptoms of this condition, which were also included in the later editions of his excellent work.

F. Schieck³ presented, in 1931, a summary of the types of marginal ulcerations of the cornea. He divided marginal ulcers into six groups: (1) Catarrhal marginal ulcer. (2) Infectious marginal ulcer. (3) Traumatic marginal ulcer from infarcts of the meibomian glands. (4) Marginal ulcer over an arcus senilis as a trophic disturbance. (5) Marginal ulcer in keratitis from rosacea. (6) Marginal ulcer of metastatic origin. The cases presented below fall into the fourth group and following Fuchs's terminology may be classified as superficial marginal keratitis.

Gilchrist⁴ described a case quite similar to those here described. Her patient presented bilateral extensive superficial marginal ulcerations which progressed in spite of all treatment. The article was entitled ". . . keratitis marginalis profunda . . .," but the final paragraph stated that the case had progressed as described by E. Fuchs under the heading of superficial marginal keratitis.

W. A. Martin⁵ in 1899 and 1900⁶ presented four cases of this classification in which he carefully described the symptoms and gave photophobia as the most distressing subjective complaint. This author thought the condition was a pri-

mary involvement of the cornea and not superficial marginal keratitis as described by E. Fuchs.

In the Chinese literature, Soudakoff⁷ reported five cases in patients who also had trachoma. In addition he included an incomplete discussion of four more patients. From the descriptions, the cases markedly resembled superficial marginal keratitis. Nevertheless, one hesitates to include these cases, since all the patients exhibited a trachomatous state.

In an article, entitled "The changes of old age in the human eye," G. Attias⁸ accurately wrote concerning this condition. Microphotographs were included which clearly showed the changes characteristic of superficial marginal keratitis, although the author failed to point out or describe the histologic changes.

The first patient of the present report had superficial marginal keratitis in both eyes with unusually severe subjective and objective symptoms, necessitating bilateral enucleation. The second patient also had this disease in both eyes. In the second case, only the clinical changes can be described.

REPORT OF CASES

Case 1. The patient, a 65-year-old white male, married, was first seen in the eye clinic at Washington University, on June 26, 1930. The chief complaint was an inflamed left eye with intermittent pain for preceding two months.

While at work two months before, lime and sand had blown into the left eye. The patient went to a general physician who treated him for about two to three weeks. After this, the eye was improved

* From the Department of Ophthalmology and The Oscar Johnson Institute, Washington University Medical School.

and the patient returned to work. About three weeks later (six weeks following the injury), the left eye again became sore and he returned to his physician. This recurrence of the inflammation persisted and became worse in spite of all treatment. The latter had been continuous until one week previous to his visit at the clinic. The vision had become markedly impaired and the eye remained extremely painful. The patient had had complete dental extractions since the onset of the present illness, but this had no effect in altering the course of the condition. There had been no constitutional symptoms. In the history, the patient stated that he had always had frequent headaches. The appetite had become unusually poor, but without any nausea or vomiting. He was constipated and had a chronic cathartic habit. He had nocturia and for the preceding two to three weeks had had some pain and burning on urination, but without any hematuria.

Examination: In the right eye was a small corneal scar near the limbus at the 7-o'clock position. Vision was 6/30 without correction. The findings were otherwise negative for this eye. The vision of the left eye was the ability to detect hand movements at one meter. The bulbar conjunctiva was reddened. There was present a superficial ulceration of ring form completely surrounding the cornea. The corneal center for about 4 mm. in width was fairly clear. Numerous small blood vessels extended from all directions into the cornea. The pupil was wide and the iris indistinctly visible. The globe was very sensitive to palpation. The impression at this time was multiple marginal ulcers of the cornea. Protargol, atropine, and holocaine ointment were prescribed. The patient was seen in the clinic on the following two days, and the eye condition did not change.

On July 1, 1930, the patient was ad-

mitted to Barnes Hospital for treatment of the corneal ulcers of the left eye. The general examination was essentially negative except for a moderate degree of emphysema. The blood pressure was 164/84. The examination of the urine was negative. The patient was given infra-red therapy in addition to the local treatment prescribed in the clinic. By July 3, 1930, the ulcerations covered the cornea except for a small area over the pupillary region and the vision was reduced to light perception. The patient was suffering considerably, and, as he had not responded to treatment, enucleation was advised and carried out.

On July 21, 1930, the vision in the right eye was 6/30 and with correction of +1.50 D. sph. \approx +1.00 D. cyl. ax. 90°, the vision was improved to 6/10. The patient came into the clinic eight days later with the right eye somewhat irritated. Examination showed no ulceration or infection. A solution of zinc sulphate was prescribed for use at home. At the next visit 10 months later, May 1, 1931, the patient complained of poor vision in the right eye. He stated that he had had redness and pain in the eye for several days, two months previous to this visit. This trouble had been relieved with home remedies. Examination of the eye on May 1, 1931, showed some peripheral marginal corneal scarring, but no active lesions. Although the center of the cornea was transparent, the center of the lens showed incipient senile-cataract changes, making a clear view of the fundus impossible. The patient was seen on May 15, 1931, and the examiner was unable to improve the vision of 6/30 with any lens. The eye was comfortable at this time.

After an interval of 16 months, the patient returned to the clinic on September 29, 1932, stating that for the past seven days his right eye had been painful. Examination showed an intense circum-

corneal injection. There was observed an ulcer of the cornea involving the superior nasal marginal portion. Several marginal corneal scars were present. A red reflex from the fundus was present but no details were visible. The vision was 1/60 without correction. The patient was given local treatment with weak solutions of silver nitrate and zinc sulphate and told to use hot compresses at home. On a later visit a pseudopterygium with a small area of staining at its pupillary edge was noted. There was present at this time no active process in the cornea as indicated by the lack of pericorneal injection. On October 12, 1932, the tension of the eye was normal and there occurred no staining of the cornea with fluorescein. Examination one week later showed a small superficial vesicle on the cornea just outside the pupillary area at the 10-o'clock position. Shortly thereafter, the cornea healed, and the eye was free from injection and pain.

About 14 months later, the patient again came to the eye clinic. Because of the seriousness of the findings in his remaining eye, he was immediately admitted to the hospital. He said that the right eye, in the previous six months, had gradually become more painful. The patient had not consulted any physician. The pain had become almost unbearable and the vision had been completely lost for the past three weeks. Examination at this time showed a central loss of epithelium about 4 mm. in diameter. The remainder of the cornea was completely vascularized and covered by a pseudopterygium. The bulbar conjunctiva was injected and edematous. On account of the loss of all vision and the intense degree of pain, enucleation of the right eye was performed on January 3, 1934.

Anatomic observations in left eye. The anterior epithelium of the cornea was generally absent, probably being desquamated, as is common, at the enucleation.

In the periphery of the cornea, adjacent to the limbus on each side, there was present a ring-form ulceration. This ulceration was wider on the nasal side, where it involved about one third of the diameter of the cornea. On the temporal side, about one fourth of the corneal width was ulcerated. The depth of the ulceration was greater also on the nasal than on the temporal side, being about one fourth of the corneal thickness at the former and about one fifth at the latter site (fig. 1). The depth of the ulceration was greatest at about halfway between the corneoscleral junction and its central corneal margin. This ulceration had destroyed the superficial corneal lamellae including Bowman's membrane. Infiltration with pus cells was especially intense in the cornea below the ulcerated areas. In the uninvolved center of the cornea, pus cells occurred in moderately dense numbers between the corneal lamellae. In addition there was observed an intense, diffuse proliferation of the fixed corneal cells or corneal corpuscles. A few small blood vessels were observed in the ulcerated peripheral portion of the cornea, both superficially and lying deeply between the lamellae of the cornea. An intensely infiltrated and highly vascularized bulbar conjunctiva was seen everywhere overlapping the corneal limbus and producing a pseudopterygium, thus forming in most places a reduplication of the stratified squamous-cell epithelium (fig. 2). This pseudopterygium was present in the entire corneal circumference, extending nasally over the entire width, temporally only a part of the width of the ulcerated area. From this pseudopterygium, the squamous-cell epithelium was solely derived. The epithelium covering the middle portion of the corneal ulceration had proliferated inwards from the apex of the pseudopterygial fold. This epithelium varied greatly in thickness from several flattened layers up to that of

an epidermal covering. In some places, there were present areas of considerable extent possessing keratinized or horny outer layers.

The uveal tract was generally atrophic,

of secondary degeneration as was manifested by small, clear, cystic spaces in the ganglion-cell layer. The optic papilla contained, nasally, many small and large, irregularly formed masses of amylaceous



Fig. 1 (Ellis). Left eye. Section through cornea with superficial marginal keratitis showing to the right a deep loss of substance from ulceration covered by stratified epithelium and to the left only a superficial loss of substance uncovered by epithelium; under the latter area, the cornea propria presents much proliferation of the corneal corpuscles and considerable infiltration with pus cells. ($\times 90$)



Fig. 2 (Ellis). Left eye. Section through cornea with superficial marginal keratitis at apex of pseudopterygium showing to the left a covering stratified epithelium together with a deeply lying stratified epithelium. In the subjacent cornea propria, numerous pus cells are infiltrating between the constituent lamellae, and an intensive degree of proliferation of the corneal corpuscles occurs. ($\times 130$)

and melanin could be observed wandering out of the dilator pupillae muscle and from the pigmented epithelium of the iris, ciliary body, and retina. Pigment from these sources lay in the iris-angle and on the filtration trabeculae. The uveal tract showed practically no cellular infiltration. There was present a broad posterior adhesion of the pigment epithelium to the anterior surface of the lens. The lens showed an incipient senile cortical cataract. The retina presented a small degree

bodies. The optic nerve was moderately atrophic.

Summary: Superficial marginal ulceration with overgrowth of a pseudopterygium was observed. The pseudopterygium here, unlike a true pterygium, was everywhere closely adherent to the underlying structures. The internal epithelium, lying just superficial to the corneal ulceration and due to the overgrowth of the conjunctival fold, had disappeared in some places.

Anatomic observation in right eye.

The anterior epithelium was present over the entire cornea. Its thickness varied from two to three layers of flattened cells up to a very thick stratified squamous-cell epithelium. As in the fellow eye, a ring-shaped ulcerative process of the corneal margin was present (fig. 3). The latter was more extensive nasally, extending over the entire nasal half of the cornea. Temporally the ulceration involved but little more than one fourth of the width of the cornea. Hence an area of

cells occurred in many places in the floor of the ulcer. At one place, on the nasal side in the floor of the ulcer, there were observed numerous epithelioid cells and a few foreign-body giant cells (fig. 4). The latter were undoubtedly produced by a reaction to some chemical substance. Also unlike the fellow eye, there was present in places, new-formed connective tissue or cicatrization, indicating an attempt to heal the ulcer. In the middle of the cornea, there occurred very few pus cells between

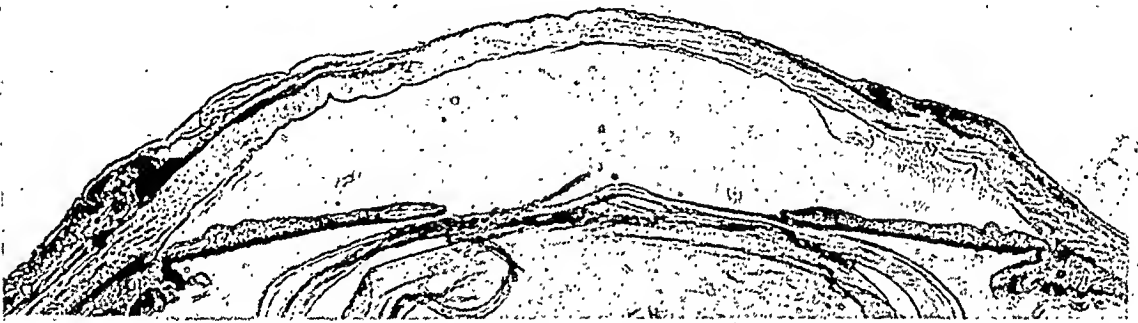


Fig. 3 (Ellis). Right eye. Section through the entire width of the cornea with superficial marginal keratitis showing peripheral loss of substance and accompanying cellular infiltration. ($\times 9$)

less than one fourth the corneal diameter remained unaffected. This paracentral portion was covered with an extremely thin epithelium consisting of three to five layers of flattened cells. Only in this part of the cornea was Bowman's membrane present. The depth of the ulceration extended to about one fourth the corneal thickness at its deepest place, both nasally and temporally. The loss of substance from the ulceration involved to a greater degree the medial two thirds of the nasal portion and the central part of the temporal portion of the cornea. The ulceration had generally destroyed Bowman's membrane and the superficial lamellae of the cornea propria. In this eye the infiltration with pus cells at the site of the ulcer was not so intense as in the left eye. On the other hand, on account of the length of time the inflammation had continued in this eye (four years), small round

the corneal lamellae. The proliferation of the fixed corneal cells was slight except adjacent to the ulceration. Blood vessels were noted just beneath the epithelium in the ulcerated areas.

The bulbar conjunctiva of this eye adjoining the cornea was swollen in varying degrees from dense infiltration with small round cells, congested blood vessels, and edematous fluid. It had overlapped the corneal margin in its entire circumference to form a pseudopterygium (fig. 5). The reduplication of the epithelium from the latter extended inwards nasally for about one half the width of the ulceration. Temporally, no second underlying epithelial layer was present. It is possible that a pseudopterygial fold occurred, and that in time the deeply lying epithelium disappeared. Only very slight keratinization was noted covering the surface epithelium on the nasal side.

The uveal tract was atrophic and there was observed the wandering-out of melanin from the pigmented epithelium of the iris, ciliary body, and retina; however, these changes were not so extensive as in the left eye. There was little pigment on the filtration trabeculae. The uveal tract

and had almost entirely disappeared from the remainder of the retina. The optic papilla was a little swollen and the retina was pushed away from the optic nerve, particularly on the nasal side. On the latter side the optic papilla contained many large and a few small, irregularly formed

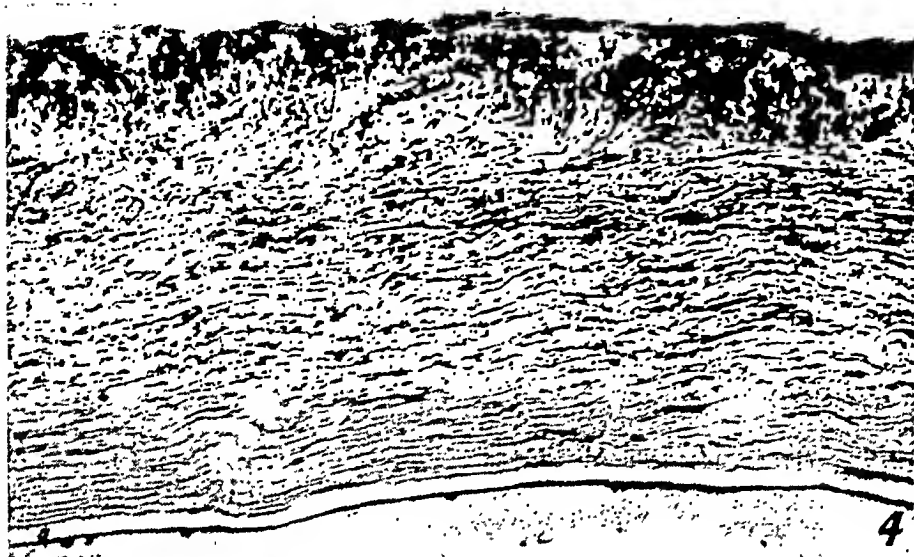


Fig. 4 (Ellis). Right eye. Section through cornea with superficial marginal keratitis showing epithelioid and giant cells to the right in the floor of the ulcer. In the subjacent cornea propria, a moderate degree of infiltration with pus cells and proliferation of the corneal corpuscles are present. ($\times 160$)



Fig. 5 (Ellis). Right eye. Section through cornea with superficial marginal keratitis showing apex of pseudopterygium and two layers of stratified epithelium to the right. Numerous small round cells are present in the floor of the ulcer to the left and in the subepithelial connective tissue of the conjunctival fold to the right. ($\times 140$)

showed almost no cellular infiltration. In the lens was seen minute evidence of an incipient senile cortical cataract. The retina presented a secondary diffuse cystic degeneration particularly in the rod-cone and ganglion-cell layers. The fovea centralis also showed an intensive secondary degeneration and replacement of its constituents with edematous fluid. The ganglion cells were present in normal numbers only around the fovea centralis

masses of amylaceous bodies. The optic nerve was moderately atrophic.

Summary: An extensive superficial marginal ulceration of long standing was present. A pseudopterygium here also partly covered the ulcerated area. The layer of epithelium lying deeply over the ulcer, and due to the pseudopterygium, had largely disappeared. It was interesting to note in the optic papillae of both eyes amylaceous bodies accompanying

the degeneration of the retina.

Case 2. The second case concerned a 70-year-old white female who entered the Washington University Out-Patient Department in April, 1938, complaining of burning and watering of the eyes for the past two years. Examination of the eyes showed a moderate congestion of the conjunctival blood vessels of the eyelids of both eyes. The corneae of both eyes exhibited an annular, bluish-gray, marginal zone extending from near the limbus inwards about 3 mm., and superiorly for at least $3\frac{1}{2}$ mm. The central margin was indistinctly demarcated from the normal cornea. A uniformly narrow, clear, circular interspace was noted peripherally to this bluish-gray zone. No arcus senilis was present; however, this bluish-gray zone was in the usual position of the arcus senilis. In the left eye there were observed two whitish superficial linear opacities, about 2 mm. long, lying within the bluish-gray marginal zone nasally and inferiorly. Under examination with the slitlamp and corneal microscope, the bluish-gray peripheral zone in each eye appeared to be inflammatory infiltration of the superficial corneal lamellae, and the whitish linear opacities were shallow depressions with very small, superficial blood vessels extending to them from the nearest part of the corneal limbus. These linear opacities were undoubtedly superficial scars probably resulting from an ulceration. When the patient was last seen there existed a faint yellowish opacity extending centrally, within the bluish-gray marginal zone, from each of these linear scars. This apparently indicated some activity. There was never present any staining of the cornea with fluorescein while the patient was under observation. The right eye examined with slitlamp and corneal microscope showed a small, superficial, whitish circular area about 1 mm. in diameter at the 5-o'clock position. This was also

vascularized, and likewise lay entirely within the bluish-gray marginal zone. The remainder of the ocular examination was entirely negative except for very early cortical lens opacities of both eyes, and a minimal degree of arteriolar sclerosis of the retinal blood vessels. The two latter changes were entirely in keeping with the patient's age. The vision, taken with the Snellen test chart, was 6/10 for each eye and with the correction of +1.50 D. sph. \ominus +.25 D. cyl. ax. 90° for each eye, the vision was improved to 6/7.5. With an addition of +2.50 D. sph. the patient read Jaeger 2 at 33 centimeters.

The patient also gave a history of morning cough with expectoration of one-quarter to one-half cup of sputum, which, however, was never streaked with blood. The patient's husband, one brother, and two sisters had all died of pulmonary tuberculosis. Examination in the medical clinic revealed râles in the apex and base of the right lung. The blood-pressure was 160/65 mm. of mercury. Bronchiectasis was diagnosed and the patient put under appropriate treatment.

DISCUSSION

Fuchs² describes superficial marginal keratitis as a rare disease occurring in persons of middle and more advanced age. A superficial ulceration spreads irregularly over the cornea, starting from the periphery. The ulcerated margin is indistinctly demarcated from the transparent central portion by a fine gray line. This ulcer is extremely shallow, and its edge is not undermined. Superficial marginal keratitis is characterized by numerous remissions and recurrences over a period of years. Pseudopterygium commonly accompanies it. The patient usually complains of a mild discomfort of the eyes, although in our first case and in that presented by Gilchrist,⁴ the symptoms were those of extreme pain. There

is present at first a grayish, peripheral infiltration of the cornea which becomes yellowish with the ulceration. Schieck³ is of the opinion that these ulcers develop in the corneal periphery as a simple loss of substance due to a deficient nutrition, the latter being indicated by the fatty infiltration of this region. He therefore, considers the process to be of endogenous etiology. Schieck notes that there is usually seen the interval of clear cornea (about 1 mm. wide) adjacent to the limbus, and that these ulcers lie entirely within the zone of the arcus senilis.

It must be kept in mind that these cases are not those of marginal dystrophy or furrow keratitis. Gifford⁹ does not believe that marginal dystrophy occurs on the basis of an arcus senilis. The two conditions (superficial marginal keratitis and marginal dystrophy) are quite distinct according to Doggart.¹⁰ The latter states that approximately one third of some 80 patients with marginal dystrophy described in the literature were under 40 years of age and in a few instances under 20 years. In several instances, the absence of arcus senilis in furrow keratitis in

elderly individuals has been specifically mentioned. Furrows have also been observed as separate from and bearing a peripheral relation to an arcus senilis.

Up to the present time there have been presented in the literature 5 cases of superficial marginal keratitis, not including the two described here. Much of the contributions on marginal keratitis to be found in the literature concerns marginal dystrophy, and also hereditary corneal conditions occurring in children.

CONCLUSIONS

The first case of superficial marginal keratitis herein described presented severe bilateral involvement, which greatly interfered with vision and caused intense pain, necessitating the enucleation of both eyes. Opportunity was thus offered for describing the anatomical findings in this condition. This is the first time that the anatomical findings of superficial marginal keratitis have been published. A second case with the clinical findings of superficial marginal keratitis is reported.

640 South Kingshighway.

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CONGENITAL ABDUCENS PARALYSIS

CARL APPLE, M.D.
Chicago

The reason for reintroducing the subject of congenital abducens paralysis is two-fold: (1) To bring this subject to the fore again and review some of the work of Alexander Duane,¹ Julius Wolff,² Harold Gifford,³ and Robert Salus,⁴ who devoted much of their time to the study and description of this condition. (2) To report 15 cases that were seen at the University of Illinois Eye Clinic during the past 10 years. Three patients in this group came under my own personal observation and were operated upon to determine the anatomic condition of the internal and external recti muscles, and to correct the associated strabismus.

In this paper I shall refer to the condition, as did Dr. Harold Gifford in 1926, as congenital abducens deficiency. It is not a common condition. In 1905, Alexander Duane reported 54 cases, six of which were his own. Julius Wolff wrote that a certain feature of this condition, namely retraction, was first brought to his attention in 1899 by Türk, and that only seven cases were reported up to 1900. Dr. Harold Gifford saw his first case in the early '90's; by 1926 he could bring the total number of reported cases to 105 monolateral and 34 bilateral; he added to these 30 monolateral and 9 bilateral cases from his own practice.

As is well known, congenital abducens deficiency occurs most frequently in females and involves the left eye more often than the right. In our series of 15 cases there were 9 females and 6 males, or 60 percent females, which compares with Dr. Gifford's 60 percent and Dr. Duane's 70 percent. Four of the 15 were bilateral, 11 monolateral; of the latter, 9 had the left eye involved. This also is in

agreement with the statistics of other writers.

Seven of our group were hyperopic with moderate astigmatism, one myopic, and another had an astigmatism of three diopters. Of the 11 monolateral cases, 6 patients had orthophoria, 4 convergence, and 1 had a divergence. Of the bilateral cases, 2 patients had orthophoria and 2 convergence. These findings are consistent with those of other investigators.

The cause of left-eye preponderance is still unknown. In 1926 Dr. Gifford discussed this from a birth-injury standpoint. He cited Hoefnagel, who called attention to the fact that left occiput anterior presentations occur in 70 percent of normal births. In this position, during the rotation of the skull, the left temple would be forced against the promontory and the pressure might cause an anemia which, if long continued, could induce the degeneration of the externus muscle into a fibrous band. He also called attention to Leser's experiments which showed that a pressure anemia of two to three hours produces a myositis followed by nearly complete regeneration of the muscle, but if the pressure continued for five to six hours, the greater part of the muscle underwent fibrous degeneration. He concluded, however, that birth injury has not been found the cause of congenital abducens deficiency in any case. The excess of left-eye involvement is considerably greater than is the left occiput anterior position over the other presentations. He also cited a typical congenital abducens deficiency case in which delivery was by Caesarian section.

Congenital abducens deficiency is manifested by a group of objective findings.

Some of these are present in all cases to a greater or less degree, and others may or may not be present in some. Among the important objective findings are: (1) restriction of abduction; (2) restriction of adduction; (3) retraction; (4) oblique upward and downward movements; (5) protraction; (6) insufficiency in convergence; (7) torsion movements. This group of symptoms constitutes Duane's syndrome.

Restriction in abduction may range from slight deficiency to that of complete absence. In those who possess some abduction power, this becomes more marked on looking up and out or down and out. An outstanding feature is the absence of contracture of the internus in spite of the completeness of the apparent paralysis of the externus.

The retraction phenomenon has been the subject of greatest controversy. It may be absent in a small percentage of cases or it may range from 1 to 10 millimeters. In 1900 Julius Wolff devoted a great deal of space to theorizing on this particular point. He described retraction as "that condition when by the contraction of one or more of the external ocular muscles, the eyeball is drawn back into the orbit, and returns to its former position when the contraction ceases." He quoted Tuerk, who in 1896 suggested two possible theories: (1) the faulty-insertion theory, and (2) the fixation theory.

According to the *faulty-insertion theory* the retracting muscle, which is the internal rectus, is attached to the eyeball farther back than the normal attachment; consequently, the portion of the muscle capable of unwinding itself from the globe is diminished and inward rotation is correspondingly replaced by a backward pull on the globe when the internal rectus contracts.

In advancing the *fixation theory*, Tuerk assumed that the paralyzed external rec-

tus consists of an unyielding connective-tissue band in place of the elastic fibers. It therefore fixes the eyeball on the outer side and offers an obstacle to adduction, so that the eye can yield to the traction of the internal rectus only by moving back into the orbit at the same time that it turns inward. This theory, however, does not explain the occurrence of retraction when there is no power of adduction. Some writers, as Parker,⁵ Peschel,⁶ and Schapring,⁷ were of the opinion that the retraction is caused by the superior and inferior recti. They supposed that in those cases where the action of the internus was ineffective, the superior and inferior recti, by contracting very strongly and by acting vicariously as adductors, would pull the eye back into the orbit.

Wolff proved the inelasticity of the paralyzed external rectus muscle in several cases by the fact that even strong traction with the forceps could not produce pure adduction.

Stilling⁸ operated upon his patient in order to cure the divergent strabismus. He advanced the internal rectus, which was found to have a normal insertion. The result was that the retraction became even more pronounced than before.

Wolff also operated on one of his patients in order, if possible, to cure the retraction. He found both the external and internal recti normally inserted and divided the external in the hope that it would reattach itself farther back. The immediate result of the operation was that the slight abduction originally present was lost, adduction increased and the retraction was no longer to be seen. After the muscle had reattached itself, however, the condition was just as it had been before. He concluded that since a normally inserted internal rectus caused retraction of the globe, there must have been some fixation on the outer side

by the external rectus short muscle.

Thirty-four years later, in 1934, Professor Salus came forward with additional findings that help to disprove Hueck's fixation theory, which Wolff had accepted as the most plausible. Salus started with the supposition that if the external rectus is the cause for the retraction, then the retraction should disappear when the muscle is severed from the sclera at its insertion. He cited three cases of typical congenital abducens deficiency with retraction in which he operated. In all these cases, neither the retraction nor the associated squint showed any changes when the externus had been severed. After resuturing this muscle and then tenotomizing the internus, he still found no change in either the retraction or squint. But in two of the three cases he found, as others have found, a muscle band underneath the internus which was attached to the sclera closer to the equator. When this was severed both the retraction and strabismus disappeared, and a certain amount of abduction became possible.

He is of the opinion that in many cases these medial bands are responsible for the lack of abduction and the retraction. Further, since these bands have existed since birth, not permitting any function of the externus, he believes that changes of the externus, such as the disappearance of muscle fibers, connective tissue, and fatty degeneration, are secondary.

Working along the line of thought of Professor Salus, I also attempted to look for pathology in the region of the internal rectus. In two of my cases I was able to demonstrate muscular bands underneath the internus and in the third there was a fan-shaped addition to the internus proper.

Case 1. L. N., a girl, 11 years of age, had typical evidences of left congenital abducens deficiency. Here I found a 4-mm. wide muscular band running under-

neath the internal rectus muscle. It was inserted obliquely and somewhat posteriorly to the original insertion and extended for about $1\frac{1}{2}$ cm., then joined the inner aspect of the internus. *Passive abduction* after tenotomy of the internus still met with resistance, but, after severing this band, the eyeball became freely movable in all directions. The externus, on the other hand, appeared like a grayish connective-tissue cord; no distinct muscle fibers were noted. Later the palpebral fissure appeared somewhat wider, the retraction seemed less, and a slight amount of abduction became possible. I failed to excise this muscle band. When last seen on April 13, 1938, there still was present 10 degrees of abduction; adduction was not improved, and the palpebral fissure was slightly wider than it had been prior to the operation.

Case 2. M. K., a girl, 3 years of age, had a right congenital abducens deficiency and an associated 20-degree convergence. Here, also, I found a muscle band stretching from below the internus to the bulbus, attaching itself a little posterior to the normal attachment. As in case 1, passive abduction met with resistance after tenotomy of the internus, and the convergence was unaltered; but when the band from the scleral attachment was severed, the eyeball became freely movable. I did not investigate the externus in this case. The internus was receded 3 mm. Twelve days after the operation, the eyes were parallel and abduction was markedly improved; the palpebral fissures were of equal size. The child was moved to Montana but the parents coöperated and sent me the pictures and information I requested. It seems that abduction is present and convergence has been corrected. The mother writes that the child's eyes are in good position and the palpebral fissures are of equal size.

Case 3. B. B., a girl, $6\frac{1}{2}$ years of age,

had a typical left congenital abducens deficiency and an associated convergence of 10 degrees. Here, no muscle band was found, but the internus appeared thicker than normal and there was a fan-shaped addition at its insertion. The externus did not appear completely fibrous; definite muscle tissue could be discerned. A mild recession of the internus was performed. When last seen on April 13, 1938, the eyes were in parallel position, about 12 degrees of abduction was present, and the retraction which formerly was about 3 mm., was now questionable; the palpebral fissure was a little wider in the primary position than it was prior to the operation.

Of the other lesser discussed signs:

Adduction deficiency is most frequently encountered. It may be normal but generally it is either slightly or considerably diminished. In his series, Duane found eight cases with complete absence of adduction. In our series we found insufficiency but none with complete absence. Fixation for long in an adducted position is difficult to maintain. This finding can also be explained by the anatomic condition of the external and internal recti muscles.

The constant enophthalmos in the primary position which is observed in many cases is also readily explained by the same mechanism if we bear in mind that normally, in the primary position of the eyes, all the extrinsic muscles are in a state of slight contraction and are relaxed completely only when the antagonists contract. The *propulsion* of the globe during attempted abduction is thus thought to be due to the complete relaxation of the internal rectus.

The *oblique upward and downward movements* remain under controversy. Wolff thought them due to the resistance the optic nerve offers to the recession of the eyeball during adduction. Since the

optic nerve has a firm consistency, it offers a certain amount of resistance to the backward movement of the eyeball at its point of attachment. Unless the resistance is directly in the plane of the retraction, the effect must be to rotate the cornea upward or downward, depending on the anatomical peculiarity. Duane thought them to be due to an anomalous insertion of the internus, causing it to act partly as an elevator.

The *narrowing of the palpebral fissure* on adduction is apparently due to the natural position of the lids in their relation to the position of the eyeball, although some writers are of the opinion that the contraction of the orbicularis is partly responsible for this.

As to the *treatment* of congenital abducens deficiency, some investigators advise no operative interference, whereas others see no objection to this when the deformity is marked. Professor Salus, on the other hand, is of the opinion that bands, such as he has found in the region of the internus, can be expected in many of these cases; they should be investigated and excised. In one of my cases I found a definite improvement in abduction as well as in the squint; in another the squint was corrected; in two, a slight amount of abduction remained possible and the retraction lessened. I see no objection to investigating the status of the internal rectus muscle, especially in those cases in which there is associated strabismus. If, as Professor Salus thinks, the changes in the external rectus are due to its inactivity, caused primarily by bands of the internal rectus, would it not seem reasonable to investigate these cases as early as possible, to release these bands? The external rectus would thus be given the opportunity to develop.

Little can be done to improve abduction in those cases in which the external rectus has undergone complete degenera-

tion; however, some improvement in the retraction can be expected when muscle bands are found and resected.

In the hope that not all the muscle fibers have undergone degenerative changes, I requested two of my patients to go through systematic ocular exercises, after the operation, to improve abduction. So far there is only slight improvement following the operation, 10 degrees in one case and about 12 degrees

in the other. I do not know whether any greater improvement will be obtained; nevertheless, it is worth trying.

In conclusion, I wish to say that the last word pertaining to congenital abducens deficiency and its various phenomena has not yet been said. Further investigation is necessary to advance our knowledge of this condition.

55 East Washington Street.

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NOTES, CASES, INSTRUMENTS

A CORNEOSCLERAL UNION FOR CATARACT OPERATIONS

PHILIP M. CORBOY, M.D.
Valparaiso, Indiana

Probably the chief reason why so many operators fail to use corneal sutures is because they do not realize what amount of handling the cornea will stand.

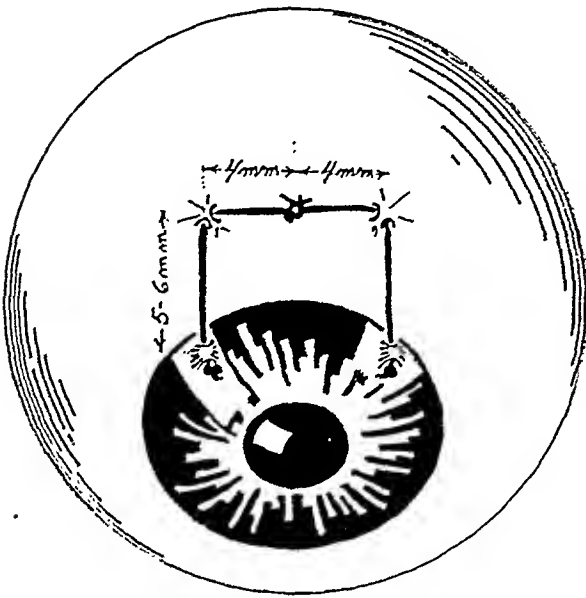


Fig. 1 (Corboy). Corneoscleral suture for cataract operations.

In reality, the average healthy cornea will tolerate numerous sutures for long periods and at the same time allow healing processes to take place. The healthy cornea does not become opaque from clean operative procedures, but only when pathological processes set in. The extensive trephining and suturing in corneal transplants as done by Tudor Thomas of London and by Castroviejo of New York substantiate this.

The thickness of the adult cornea will vary from 0.75 mm. to 1.2 mm., the peripheral part being the thickest. The

portion external to Descemet's membrane constitutes 95 percent of this, or from 0.6 mm. to 0.9 mm. It is through the upper layers of the cornea that sutures should be placed.

In the past there have been many objections to corneal sutures; namely, (1) The attempt to get apposition of the wound between the cornea and the sclera is dangerous because of the possibility of injuring the ciliary body, or causing undue tension and sustaining a prolapse. (2) The mattress or double-armed suture so often acts like a knife and cuts its way out. (3) The length of time necessary for inserting corneal sutures especially in the more complicated methods is too great. The objection to conjunctival sutures lies in the fact that they depend for support upon the bulbar attachment of the conjunctiva. A severe hemorrhage or prolapse under the flap can dissect up a large amount of conjunctiva.

The sutures in this new method are placed approximately at the 10- and 2-o'clock position, about 2 mm. from the limbus. The needle enters the cornea tangentially to the corneal radius and emerges 1 to 2 mm. upward. The distal end of the suture is provided with a knot at least 1 mm. in size to prevent the suture from pulling through the needle tunnel. The needle is then introduced into the episcleral tissue 5 or 6 mm. above the limbus, approximately 3 mm. laterally to the vertical line bisecting the cornea, and is directed nasalward. The second suture is then placed and the two ends are tied in a loose knot in the midline. The loops are laid to one side to permit the Graefe incision. The customary conjunctival flap is made beneath these sutures. The small

loops left available at each side can be held up by an assistant, who uses a strabismus hook for that purpose during the section and subsequent procedures. The sutures are then drawn up snugly and tied. The surgeon may perform any method of extraction he sees fit. The replacement of the iris can be accomplished after the sutures are tied. The two knots resting on the cornea are not irritating and may be left in from three to seven days, as the case may require.

The necessary equipment is: (1) corneal silk, usually .0000 or .00000 black and twisted; (2) corneal needles, either the ordinary needle of Kalt, or a smaller 10-mm. arterial needle (the important thing is not the length of the needle from tip to heel, but its thickness. A thin needle is best, necessitating a smaller knot; the only drawback of a thin needle is its fragility). (3) The needle-holder must be small and light with jaws small enough so that the needle will not roll (it must not lock, for the operator must let loose his grip on the needle instantly when necessary). (4) A fixation forceps will facilitate the placing of the sutures in the cornea, the point of fixation being usually at the opposite side of the globe.

The author has used this method of suturing during the past year with good results. At times it has been the saving grace, where nothing else would have averted disaster. In 50 cases, 3 would have failed without the suture, as vitreous prolapses were in progress. I know of no other suture that can be so effective and yet so simple. It should be emphasized that the suture must not be too tight, as there is always a little edema following the operation. The author usually removes the sutures on the fourth day, although for experimental reasons they have been left in 10 days without untoward results.

8 Monroe Street.

RETINAL DETACHMENT

REPORT OF TWO CASES WITH INTERESTING OPERATIVE RESULTS

BARNET R. SAKLER, M.D.

Cincinnati

The prognosis of spontaneous and traumatic detachment of the retina was considered hopeless until a few years ago. Gonin, in 1929, reported the results of his ignipuncture method in 81 cases of retinal detachment, and in 1932, 221 cases with 53 percent cures.¹ Since that time, his method of thermocautery has been replaced almost universally by the diathermy or electrocoagulation method. This procedure was introduced by Larson² and later modified by Weve, who changed from surface coagulation to the multiple micropuncture method. Today, the average case of so-called idiopathic spontaneous detachment of the retina can be assured of at least a 50-percent probability of reattachment and as high as 70 percent in selected cases.³ The prognosis, however, in cases of retinal detachment occurring in aphakia and in long-standing cases of traumatic origin, is still very poor. Two cases are reported in which the results obtained were thought worthy of recording.

REPORT OF CASES

*Case 1.** On July 28, 1936, M. M., a white male, aged 56 years, was admitted to the Illinois Eye and Ear Infirmary, service of Dr. Thomas D. Allen, with the complaint of failing vision in the left eye, duration of one week. No significant statements as to any probable etiological factor could be obtained. Previous ocular history was as follows: Injury to right orbit in 1924, with resultant blindness in the right eye within one year; admittance to the infirmary June 21, 1935,

* Presented before the Chicago Ophthalmological Society, October 19, 1936.

where a diagnosis of left senile mature cataract was made. An intracapsular lens extraction, using the Verhoeff technique, was performed uneventfully on the left eye by Dr. T. D. Allen. The patient was discharged July 9, 1935, wearing a correction of +10.50 D. sph. \approx + 1.25 D. cyl. ax. 180°, with vision of 20/30.

When examined this time the right eye was blind. External examination showed a very shallow anterior chamber; atrophic blue-green iris, ridged and bulging forward to touch the cornea at the lower limbus; pupil 2 mm., central, fixed; lens opaque. The fundus was not visible, the red reflex absent. Intraocular tension was 26.5 mm. Hg (Schiötz).

Vision O.S. 10/200 with no improvement on manifest refraction. External examination showed an aphakic eye with a deep anterior chamber, surgical coloboma above, iridodonesis, and no pupillary reaction to light. The pupillary area was optically empty.

Ophthalmoscopically the media were clear. The fundus presented a diffuse, fluctuating, wavy, serous retinal detachment, hanging in grayish translucent folds, uniformly elevated, 4 to 6 mm. superiorly and 1 to 2 mm. inferiorly, extending from the peripapillary area to the ora serrata, most marked from the 10- to the 1-o'clock position. No retinal tears could be found. The disc margins were well defined, the surface normal, color good, physiological excavation central, and lamina cribrosa visible. The vessels were tortuous, dark appearing, normal ratio 4:3. The macula could not be identified. Intraocular tension was 17.5 mm. Hg (Schiötz). Transillumination was negative; the red reflex was present in all quadrants. Visual field on admission was as in figure 1. A diagnosis of idiopathic serous retinal detachment was made.

The patient was kept flat on his back for two weeks with his left eye atro-

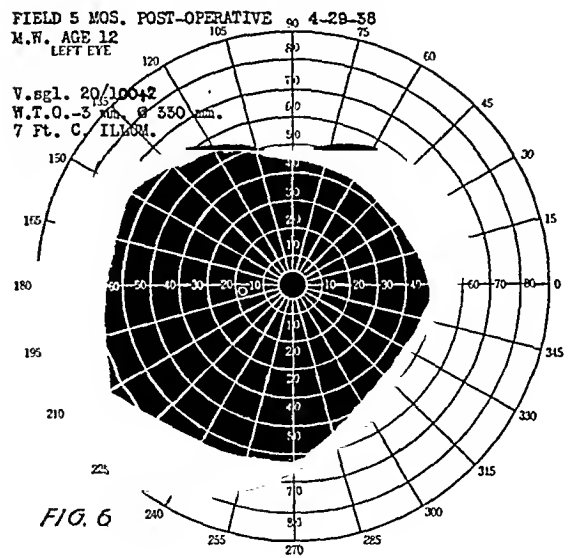
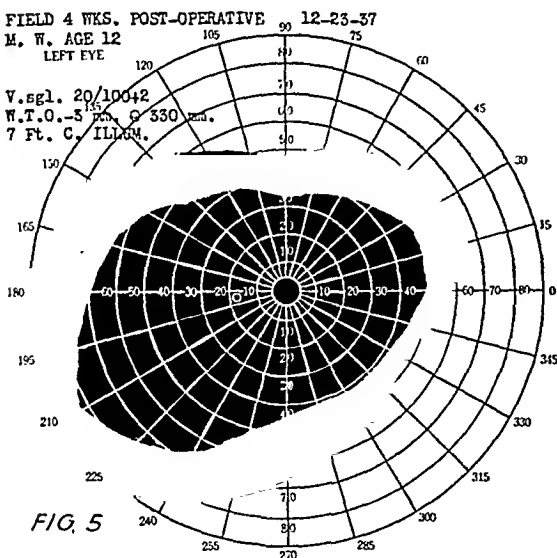
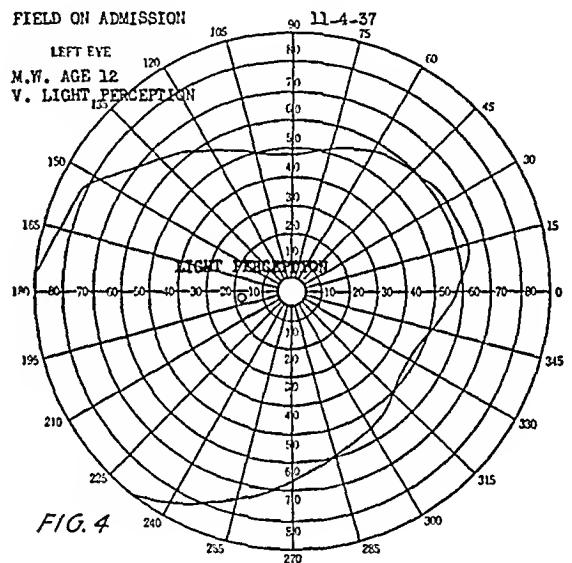
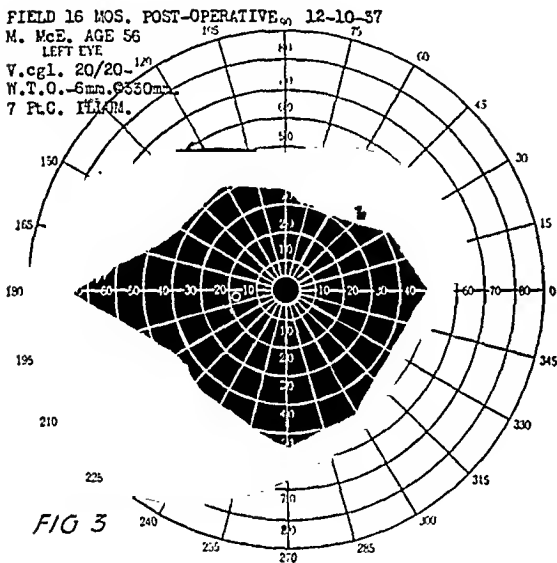
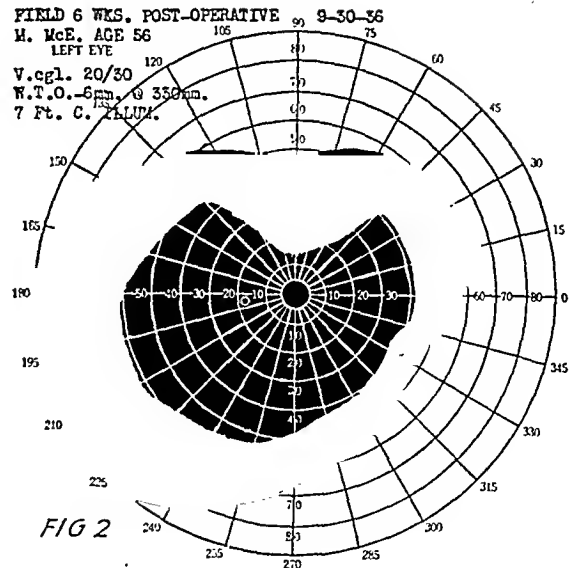
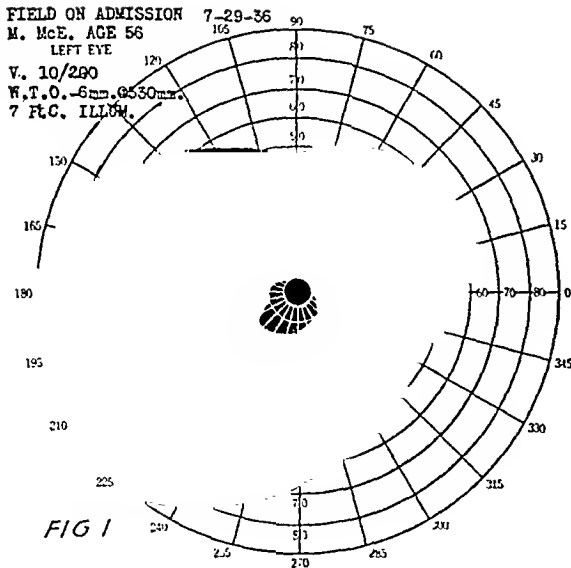
pinized. No improvement was noted. Frequent fundus examinations revealed no retinal holes. On August 14th, an operation was performed, using the technique outlined by Gradle.⁴

The postoperative course was essentially uneventful. Ophthalmoscopic examination on August 24th (10 days postoperative) showed the retina to be reattached. A linear series of black pigmented areas of chorioretinitis was noted extending anteriorly and temporally corresponding to the operative field. Confrontation method showed a definitely enlarged field. The patient remained in bed for five weeks, pinhole goggles being used after the first two weeks. The visual field was taken six weeks after the operation with results as in figure 2. Manifest refraction of +11.00 D. sph. \approx +1.25 D. cyl. ax. 90° resulted in 20/30 vision.

Examination on December 10, 1937 (16 months postoperative) showed the retina in normal position. Vision with correction was 20/20—2; visual field as in figure 3.

Case 2. On November 2, 1937, M. W., a white female, aged 12 years, was admitted to the Children's Hospital of Cincinnati for ocular study and treatment. The child complained of "blindness" in her left eye of indefinite duration. On questioning, she stated that she had been struck in the left eye and side of the head with a "kickball" about two years ago. Except for some redness and slight swelling of the eye, at that time, the incident had been forgotten. Several months previous to the present admission, the mother had noticed a drooping of the left upper lid and a tendency for the left eye to turn out.

Vision O.D. was 20/20. The external examination showed no significant findings; pupil 4.5 mm., central, reacted to light and accommodation, directly; consensual reflex to light very sluggish. The



Figs. 1 to 6 (Sakler). Visual fields in two cases of retinal detachment. Figures 1 to 3, case 1; figures 4 to 6, case 2.

intraocular tension was normal. The fundus and media were normal.

Vision O.S. was light preception and good projection in all quadrants. The external examination revealed a slight ptosis; exotropia of about 15 degrees; the pupil, 3.5 mm., reacting to light very sluggishly, irregular due to a rupture of the sphincter pupillae and posterior synchia above. Tactile tension was normal; the anterior chamber deep, optically empty.

The media were remarkably clear. The retina was completely detached, presenting a diffuse, bullous, serous detachment most marked in the upper temporal quadrant, elevated about 5 mm.; the disc was not visible, probably hidden by a fold of retina; the macula could not be identified; no retinal tears were found; no signs of retinal degeneration or inflammatory exudates were noted. Transillumination gave a red reflex in all quadrants. The visual field was as in figure 4.

General physical examination and laboratory tests such as Mantoux, Wassermann, and urinalysis, were essentially negative for any significant findings.

A diagnosis of serous retinal detachment in the left eye, traumatic in origin, was made. The question of surgery was discussed. It was felt that the prognosis was poor, inasmuch as the history indicated a time interval of about two years since the probable onset of this condition. Nevertheless Dr. Derrick Vail recommended that the patient be given the benefit of an operation.

The child was kept at absolute bed rest for two weeks, with the foot of the bed elevated. The left eye was atropinized and daily fundus examinations were made. No retinal tears were found and no improvement in the detachment was noted.

On November 20, 1937, an operation

was performed. Avertin anesthesia, supplemented with gas-oxygen, was used. The sclera, extending from the superior rectus to the inferior rectus, temporally, was exposed. A series of scleral micropunctures, by means of the Gradle needle attached to the Walker diathermy unit, was laid down and finally posterior sclerotomy with a thin Graefe knife was performed in the lower temporal quadrant. Both eyes were patched and bandaged.

The postoperative course was uneventful. The conjunctival stitch was removed on the fourth day, at which time the patient stated that she could see. One week after operation, the fundus was examined. The media were clear; there was no hemorrhage; the retina was in normal position; the optic disc, seen for the first time, was of good outline and color; the macula was not visualized; a line of discrete areas of chorioretinitis was noted, anteriorly and temporally, corresponding to the line of scleral micropunctures. Confrontation visual field was very good.

The patient was kept in bed with pin-hole goggles for three weeks. She was discharged December 24, 1937, four weeks after the operation with vision corrected as follows: O.D. + .75 D. sph. = 20/20, O.S. + 1.00 D. sph. \approx + 1.00 D. cyl. ax. 90° = 20/100 + 2. The visual field was as in figure 5.

Examination of left eye on April 29, 1938 (five months after the operation) showed the slight ptosis unimproved; the pupil, 4 mm., slightly eccentric above, reacted to light and accommodation, directly and consensually, actively; the vitreous was clear except for a few taillike floaters; the retina was in normal position; the perimacular area showed some slight pigmentary changes of chorioretinitis. Vision was 20/100 + 2 unimproved by refraction. The visual field is shown in figure 6.

CONCLUSION

1. Two cases of retinal detachment, with very poor preoperative prognosis, are reported.

2. The results obtained would seem to justify surgical intervention in almost all cases of idiopathic retinal detachment.

Doctors Building.

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SULFANILAMIDE THERAPY OF INCLUSION CONJUNCTIVITIS*

REPORT OF A CASE

PHILLIPS THYGESON, M.D.

New York

Inclusion conjunctivitis appears to run a clinical course unaffected by local therapy. No one of the 9 cases in adults nor 42 cases in infants that I have been able to follow has healed in less than three months. The average time for healing has been about six months and several of the cases lasted over a year.

In a search for a therapeutic agent effective in this disease it was logical to turn to sulfanilamide, a drug which has been shown by Loe¹ and Lian² to have a powerful therapeutic effect in the related disease, trachoma. Accordingly, the drug was tested on the experimental disease in two *M. rhesus* monkeys, a daily dosage of 0.5 gr. per pound body weight resulting in complete healing of the disease in two weeks. No change in conjunctival reaction occurred in two control animals during this test period.

The following report gives the result

obtained in the treatment of a single human case:

M. D., aged 34 years, female, came to Vanderbilt Clinic on September 1, 1938, with an acute unilateral conjunctivitis of two weeks' duration, characterized by follicular and papillary hypertrophy, most marked in the conjunctiva of the lower lid. There was a swelling of the preauricular gland, pseudoptosis, and bulbar injection with edema of the limbus, but no epithelial nor other corneal changes. Cultures and scrapings revealed no significant bacteria but moderate numbers of the epithelial-cell cytoplasmic inclusion bodies characteristic of inclusion conjunctivitis. In the differential diagnosis trachoma was discarded as a possibility in view of the absence of the limbal and epithelial lesions that occur simultaneously with the conjunctival changes of this disease.

The patient was hospitalized and placed on a daily 30-grain dosage of sulfanilamide, given in three 10-grain amounts with an equal quantity of sodium bicarbonate. No local treatment was employed. Improvement was first noted on the second day, when the bulbar injection and conjunctival secretion began to diminish. Improvement continued steadily. Thirteen days after onset of therapy the eye had returned to normal except for the pres-

* From the Department of Ophthalmology, College of Physicians and Surgeons, Columbia University, and the Institute of Ophthalmology, Presbyterian Hospital.

ence of a tiny island of follicular hypertrophy in the outer part of the lower fornix. As a similar island of hypertrophy existed in the other eye, this condition may well have preceded the infection. Sulfanilamide was discontinued at the end of 21 days. The eye has been followed for two months after healing, and there has been no evidence of recurrence. Inclusion bodies, which averaged 15 to 25 per slide at onset of treatment, dropped to one in two slides on the second day of treatment and could not be found in examinations made every second day there-

after.**

In view of previous failures to influence inclusion conjunctivitis with local treatment of many types, this rapid response to sulfanilamide therapy is considered significant.

630 West 168th Street.

** Since this report was written, a second case, a severe bilateral inclusion blennorrhea in a newborn infant, has been successfully treated with the drug. Sulfanilamide therapy in adequate dosage over a seven-day period resulted in the disappearance of inclusion bodies (after the second day), cessation of discharge (after the fifth day), and a return to normal of the conjunctiva within two weeks.

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SOME USES OF SULFANILAMIDE IN OPHTHALMOLOGY

L. PELLMAN GLOVER, M.D.
Altoona, Pennsylvania

Sulfanilamide, particularly in the form of prontosil, has proved of such exceptional value in the treatment of various eye infections that the following cases are reported. Naturally, there were some failures.

OPHTHALMIA NEONATORUM, TWO CASES

The first case in which the drug was used was in Baby F., aged seven days. A discharge had been present for three days prior to admission to the hospital on October 5, 1937. Great edema of the lids and conjunctiva was present in both eyes, with a 3-mm. perforating ulcer of the right eye. Smear showed the gonococcus in both eyes. The routine treatment for 24 hours gave no results, and, as it was feared that an ulcer would develop in the left eye, it was decided to administer prontosil. Ir-

rigations were given with saline every half hour, following which the prontosil was dropped in the eyes. Prontylin was given by mouth in milk, gr. 1, three times daily. Cold compresses were used for one-half hour on and one-half hour off. The results in 24 hours were amazing, as the eyes could be opened without effort. In three days the smears were negative. The child was discharged in 10 days with the ulcer nearly healed and the conjunctiva clear. The drops were continued in the ulcerated eye every four hours for two weeks, by which time the ulcer had flattened and was entirely healed.

Baby B., aged three weeks, was admitted on April 3, 1938, with a history of a discharge from both eyes for two weeks. Smear showed the gonococcus. This case was one of the mild forms of ophthalmia with very little edema, but a marked discharge. Treatment similar to that in the first case gave a negative smear in four days. The child was discharged on the eighth day.

ORBITAL ABSCESS, THREE CASES

Ruth J., aged eight years, was admitted to the hospital on October 19, 1937. The girl had had a cold for one week. Two days previous to admission, the left lids had begun to swell and she noticed double vision. A typical beginning orbital abscess was present with a fever of 101 degrees and 13,000 white blood cell count. A left middle turbinectomy was performed, but no pus was found. Prontosil was given intravenously, 2 c.c. three times daily, and magnesium-sulphate dressings were used on the lids. In three days all signs of trouble were gone with no diplopia. She was discharged on the fourth day.

Robert S., aged four years, was admitted to the hospital on May 16, 1938. The left eyelid had begun to swell two days previously. There was a history of chronic otitis and infected tonsils. A typical beginning abscess was present with a temperature of 102 degrees and a white blood cell count of 15,000. X-ray films showed a mass in the orbit. Prontosil, 2 c.c., three times daily intravenously, and magnesium-sulphate compresses were used. The boy was out of bed on the fourth day, acting normally, and the edema all gone.

Baby F., aged five months, was admitted to the hospital on May 19, 1938. The left eyelids had started to swell four days before, following a slight cold. On admission, marked edema was present which rapidly became worse. Since no veins could be found, prontosil was given by mouth, gr. 1, three times daily, and magnesium-sulphate compresses were used. This apparently had no benefit. The abscess was opened through the lower lid on May 22d, followed by rapid recovery. A gram-negative diplococcus was found.

CORNEAL ABSCESS, ONE CASE

Wilford S., aged five years, was admitted to the hospital on November 29,

1937. Three days before, while in a cornfield, he had fallen on a cut corn stock, striking the left eye. Nothing had been done in the way of treatment. An abscess of the cornea near the temporal limbus was present. This was 3 mm. in diameter, with bulging of Descemet's membrane present. A hypopyon half filled the anterior chamber. Prontosil was instilled every hour with atropine and cold compresses. Prontylin, gr. 2, three times daily, was given to December 4th. Typhoid vaccine, 5 million, was given intramuscularly every other day. The infection rapidly disappeared with the ulcer, and the prontosil was discontinued on December 7th. He was discharged December 11th, having only a small anterior synechia at the site of the ulcer, and the pupil well dilated.

PANOPHTHALMITIS, TWO CASES*

Samuel S., aged 72 years, was admitted to the hospital on December 2, 1937, with a typical beginning panophthalmitis, edema of the lids and conjunctiva, hypopyon, and haze of the cornea, with a small prolapse of vitreous at the 12-o'clock position. Five days before he had been discharged following an uneventful needling operation. While crossing a street, he was struck by a car so violently that the wound was opened, and evidently the vitreous was driven out. The infection followed in two days. Prontosil was given intravenously, 5 c.c., three times daily, and instilled every half hour in the eye. Cold compresses and atropine were used. The wound was cauterized with trichloroacetic acid. In 24 hours the eye was out of danger and the hypopyon gone. The treatment, along with

* Since this report was submitted a third case of panophthalmitis in a trephined eye was cured, with vision limited to light perception and projection. Another case of pneumococcic ulcer was cured, leaving only a large macula of the cornea below the pupil.

the use of typhoid vaccine intravenously, was continued for five days. He was discharged on December 9th. Vision on the eleventh was 6/12—1.

Joseph W., aged 23 years, was admitted to the hospital on April 5, 1938. That day he had been chipping stone in a barnyard. A piece of metal from the hammer pierced the center of the cornea, lodging in the vitreous. Tetanus antitoxin was given at once and cold compresses were started. In 12 hours, panophthalmitis was present. Prontosil was given at once, 5 c.c., three times daily, intravenously. This produced no results, and an evisceration was performed on the third day. Colon bacillus was found.

CHRONIC CONJUNCTIVITIS, TWO CASES

Chronic conjunctivitis is one of the most common ocular ailments seen in this locality. It usually responds quickly to simple grattage and astringent lotions. Some patients, however, drift from one physician to another without getting relief.

Mr. F., aged 39 years, a World War veteran, had been gassed. Since then he had had constant conjunctivitis of both eyes, from which he was relieved for only short periods. When first seen on January 22, 1938, he could hardly keep the eyes open and had to stop work. A severe chronic conjunctivitis, with thickening of the conjunctiva, purulent discharge, injection, and photophobia, was present. Two weeks of customary treatment gave only slight relief. A smear was then taken which showed *Staphylococcus albus*. On February 10th, prontosil was ordered, to be dropped into each eye every three hours after saline irrigations had been used. By February 25th, there was great improvement, and the treatment was reduced to thrice daily. On March 4th all treatment was stopped; the lids were thinned to practically normal thickness, and there

was no irritation. He has been doing his regular desk work, with no return of trouble for two months, the longest period of peace he has had.

Mrs. E., aged 57 years, had been treated for six months for a recurrent chronic conjunctivitis followed by a punctate keratitis. The attacks always lasted about three weeks, and atropine, among other therapy, had to be used to reduce irritation. On April 30th she developed an attack in both eyes which did not respond to treatment. On May 7th, prontosil was started every three hours, preceded by saline irrigations. On May 11th, nearly all irritation was gone and the treatment was reduced to thrice daily. By May 13th all treatment was stopped. This was the most rapid response she had ever had to any medication.

ACUTE CONJUNCTIVITIS WITH SUPERFICIAL ULCER, FOUR CASES

Mrs. Z., aged 58 years, was seen in consultation, on October 10, 1937. She was bedridden from the last stages of lymphatic leukemia. Four days previously she had developed an acute conjunctivitis in both eyes, followed by a rapidly spreading superficial ulcer. The usual care of acute conjunctivitis, combined with the use of atropine, cold compresses, and irrigations gave no relief, the ulcer having spread to about two thirds of the cornea. As the prontosil had worked so well recently in the ophthalmia case, it was thought worthy of trial. Instillations were made every hour, preceded by saline irrigations, day and night. In 24 hours the ulcer had healed about one half, and in three days epithelium had covered the whole area. The conjunctivitis disappeared in the first 24 hours also.

Mrs. R., aged 65 years, also bedridden, was seen in consultation on March 1st.

She had an acute conjunctivitis which did not respond to zinc and argyrol medication. There was a superficial ulcer about 3 mm. in diameter in the left eye, which her physician stated had been present one day. Prontosil was ordered every hour with irrigations in both eyes. In 24 hours the ulcer healed, and all treatment could be stopped in two days. She has had another attack of conjunctivitis since that time, which the prontosil corrected in one day.

Mrs. L., aged 35 years, developed an acute conjunctivitis of the left eye on May 7th, for which she used boric acid. On May 9th, she stated, pain began and when she was seen at the office on May 11th, there was marked injection of the conjunctiva with purulent discharge, and a slough of the corneal epithelium over the whole center of the cornea. Prontosil, preceded by saline irrigations, was prescribed to be administered every two hours, with cold compresses and atropine. On May 13th, there was great improvement, with only slight roughening of the epithelium, and the discharge all gone. Prontosil was reduced to administration thrice daily and the patient was discharged on the eighteenth with the cornea clear and no injection present.

Mr. E., aged 30 years, a motion-picture operator, was seen in consultation on May 21st. Four days previously he had developed an acute conjunctivitis of the left eye, for which zinc and argyrol were ordered. He continued work, but on the twentieth had such severe pain from the bright lights, that he could not continue work. When seen on May 21st, there was a slight purulent discharge, moderate conjunctival injection, and a 4-mm. ulcer of the lower cornea. Prontosil was prescribed to be administered every two hours. On May 23d, the ulcer showed only slight roughening and the patient was discharged on the twenty-fifth.

IRITIS, TWO CASES

Two cases of acute iritis were given 5 c.c. of prontosil intravenously three times daily for two days, with no results. The cases cleared up after the removal of focal infection and the use of foreign protein. The prontosil did not act as a foreign protein.

CORNEAL ULCER, TWO CASES

Mr. H., aged 65 years, a farmer, had a dislocated lens in the right eye, as the result of a blow in 1937. He had been treated elsewhere, and stated that the eye had become rapidly blind. On April 8, 1938, he was struck again in the right eye by a piece of limestone. When seen on April 11th, the eye was stony hard, with marked infection, purulent discharge, hypopyon, and a 4-mm. eroding ulcer of the center of the cornea which appeared ready to perforate. Enucleation was advised but this was refused. The cornea was cauterized with iodine and typhoid vaccine was given. On the thirteenth he was placed in the hospital, hot packs, typhoid vaccine, and protosil both intravenously and by instillation into the eye were given. Healing began at once, and the patient was discharged on the seventeenth, with instillations of prontosil ordered every three hours. He came to the office on the twenty-first, with the eye much worse, marked discharge, and great pain. He stated that he had not used the prontosil since leaving the hospital. This was started again with immediate improvement, so that by May 11th, the ulcer was nearly healed, and on the seventeenth he was discharged. A smear showed staphylococci.

Baby H., aged three months, developed pneumonia on April 29th. The family doctor stated that the left eye had become inflamed on the third day and had rapidly grown worse. The baby was ad-

mitted to the hospital on May 7th. An ulcer was present over the whole cornea which had ruptured near the limbus. A purulent discharge was present in the right eye. A smear showed pneumococci in both eyes. Prontosil was started in both eyes with saline irrigations every half hour for lack of something better. The discharge cleared up in the right eye in three days and the cornea of the left eye began healing in two weeks. After three weeks the cornea was healed leaving a large staphyloma. Possibly these eyes would have recovered with simple cleansing measures, but the disappearance of the discharge was so rapid that the prontosil probably helped.

SUMMARY

Two cases of ophthalmia neonatorum were unquestionably cured by the use of sulphanilamide directly. To see a case of ophthalmia clear up in a few days, instead of weeks, was most amazing. It is hoped that further trial will give similar results.

Two cases of early orbital abscess were cured. One case, which was seen late, was not helped. The infection was

due in this case to a gram-negative diplococcus.

One case of panophthalmitis was cured. The organism was not determined. One case was lost, the organism was the colon bacillus.

Two cases of chronic conjunctivitis were cured. The organism was the *Staphylococcus albus*.

Four cases of acute conjunctivitis with superficial ulcer were cured. No smears were taken.

Two cases of iritis were not helped.

One corneal abscess was cured.

Two cases of corneal ulcer were helped, if not cured.

Prontosil dropped in the eye did not apparently cause the least irritation in any of the cases. It appears to have a direct bactericidal action when used externally, causing a rapid disappearance, usually in three days, of the organism, particularly the gonococcus and staphylococcus.

All patients were warned not to use any type of cathartic. No ill effects were seen from the use of magnesium sulphate externally, when the sulphanilamide was given internally.

1200 Fourteenth Avenue.

SOCIETY PROCEEDINGS

Edited by DR. H. ROMMEL HILDRETH

CHICAGO OPHTHALMOLOGICAL SOCIETY

February 21, 1938

DR. THOMAS D. ALLEN, *president*

PAPILLOMATOSIS OF THE CONJUNCTIVA

DR. PHILIP A. HALPER said that his patient, a boy aged seven years, was first seen May 29, 1933, with multiple papillomata of the right lower palpebral and nasal bulbar conjunctiva, including the caruncle. The eye was irritable, reddened, and the tumors varied in size from 1 mm. to 8 mm. in diameter. The condition had been present for about a year and came on gradually following injury with an indelible pencil in the region of the caruncle. Smears showed no significant findings, and on histologic examination the papillomata showed mainly transitional cells. Wassermann reaction was negative.

On June 12, 1933, under ether anesthesia, the papillomata were removed with scissors. The conjunctiva was not excised with the tumor tissue. Following this procedure the eye was moderately reddened for a few weeks. The patient was not seen again until November, 1933, when he returned with extensive recurrence of the papillomata. At this time the tumor masses were so numerous and large that the lids could not be closed. There was extension also into the upper palpebral conjunctiva.

In May, 1934, the patient was hospitalized and under ether anesthesia the papillomata were removed. Since these tumors did not extend below the conjunctiva, it was thought best to excise each one with a fairly generous portion of its underlying conjunctiva. Each papilloma therefore was excised separately and by using a

loupe the tiniest ones measuring 0.5 to 1 mm. in diameter were removed. There was very slight postoperative reaction and the conjunctiva healed nicely. There has been no recurrence. The conjunctiva now shows only moderate scarring, and the eye otherwise is normal.

ECTOPIA LENTIS

DR. PAUL HURWITZ presented two patients of a family of three seen at Central Free Dispensary, a woman, her brother, and her son. Two others of the family had a history of verified ectopia lentis.

In all six eyes there was iridodonesis. Two pairs of pupils were elliptically shaped and eccentrically placed. In five eyes the lenses were displaced upward and nasally, the zone of internal lenticular reflection describing an arc from the 10-o'clock to the 4-o'clock position, more or less through the center of the pupillary area: there was thus an aphakic and lenticular portion of each pupil. In the sixth, the right eye of the son, the lens was only slightly displaced upward so that no aphakic portion was present. In all eyes, biomicroscopy showed a varying deficiency of zonular fibers and an irregularity of the lens margins. An alternating manifest divergence of about 40 degrees was noted in one patient.

The average uncorrected vision of each eye was 20/200, excepting that of the right eye of the son, which was 20/70. The vision of the mother could be corrected to 20/50+2: that of her brother to 20/25: and that of the son to 20/50. One patient accepted a correction of the refraction of the lenticular portion of the eye; the second accepted correction of the aphakic portion; the third, no correction without binocular diplopia. Of interest were the high myopic astigmatic skias-

copy findings of the luxated lenticular portions of the eye. In all cases there was a definite tendency toward arachnodactylia, more marked in the male members.

BILATERAL CONGENITAL MACULAR DEGENERATION

DR. MARTHA RUBIN FOLK said that the patient, C. W., aged 21 years, a white woman, was referred from the Municipal Tuberculosis Clinic where she was under treatment for bronchiectasis. There was a history of poor vision since childhood, which had grown progressively worse. The family history revealed nothing of significance. Venereal disease was denied.

Vision in the R.E. was 5/200; in the L.E., 8/200, not improved with lenses. The discs were rather hyperemic, the margins above and nasally ill defined. The retinal vessels showed marked dilatation of veins and tortuosity. In the macular region fine dark granules were grouped together closely and formed black spots irregular in shape, in size about one sixth p.d. Fine white striations radiated around the pigment zone, also a number of soft white spots and dots which were scattered throughout the periphery and about the macular region. The fields showed a 10-degree central scotoma: the peripheral fields were practically normal.

The Mantoux test gave a negative reaction; the Wassermann test a 3+ reaction. There is no history of consanguinity in the family. The Wassermann test of the mother gave a negative reaction. At present the patient is receiving injections of gold sodium thiosulphate at weekly intervals.

TREATMENT OF CONCOMITANT CONVERGENT STRABISMUS

DR. ELMER A. VORISEK read a paper on this subject which was published in this Journal (December, 1938).

THE USE OF ATROPINIZATION AND BIFOCALS IN TREATMENT OF CONCOMITANT CONVERGENT STRABISMUS

DR. GEORGE P. GUIBOR read a paper on this subject.

Discussion. Dr. Richard Gamble said that at Children's Memorial Hospital there is an unusually good opportunity to study the results of treatment of strabismus. Large numbers of cases are seen early, and on the whole they are a rather bright, coöperative group of children. Of course, in regard to occlusion, the results were not so satisfactory as might be wished, but that is universally true.

He was interested in Dr. Vorisek's figures, especially in the group of patients who had 20 degrees or less of monocular convergent squint, and who were first seen at the age of four years or less. Of this group 49 percent became straight and 25 percent became worse, whereas in the group of children four years old or older with the same degree of squint, 74 percent became straight and 7 percent became worse. This is just the opposite of what might be anticipated. He did not believe, however, that the results would have been better if treatment had been deferred until the children in the low-age group were five or six years old. He believed it wise to start treatment at the age of two or three years. It was probably true that refractions were not tested so accurately for the younger children, and perhaps the full benefit of the atropine and occlusion was not obtained. Also, some cases of alternating squint might have been included in this group. It is often difficult and sometimes impossible to be sure whether a young child has monocular or alternating squint. It is equally difficult to measure the amount of the squint angle, which may vary considerably while it is being measured.

He said that Dr. Guibor mentioned the pseudo-paralytic type of squint. This

type is interesting and quite important in that it simulates bilateral abducens paralysis, but it is really a pure type of alternating squint. It is usually seen soon after birth and the amount of squint is considerable. The child sees objects on his right side with the left eye and vice versa. So long as both eyes are open there is no need to use the external-rectus muscles. If one eye is covered it becomes necessary for the external rectus muscle to be used if the child is to see to the opposite side. Dr. Guibor did not stress the value of occlusion in this type of case as much as he himself would. The most satisfactory method is to have a baby bonnet made so that it occludes one eye and have the child wear it a few hours a day, covering first one eye, then the other.

Dr. W. F. Moncreiff, with reference to Dr. Vorisek's paper, said that it would seem rather illogical to evaluate the progress of these patients, in the sense of improvement or the reverse, on the one criterion of the size of the squint angle, when there were obviously at least two other factors of coördinate importance; namely, the state of the binocular vision, and, in the nonalternating cases, the visual acuity of the squinting eye.

By the essayist's own description of the method used for measurement or estimation of the squint angle, it could be seen that the crudity of the method would account for variations of the order which he stated were accepted as final evidence that the patient was improving or growing worse. This fact would seem to be an adequate explanation for the apparently large percentage of patients alleged to have become worse during the period of observation.

Referring to Dr. Guibor's presentation, and with reference to the cases of hyperopia combined with esotropia, it would be interesting to know how often, in the rather large material he has had the opportunity of studying, he has noted the

condition which the Germans call "Schrägschielen," in which the squinting eye has an oblique plane of rotation so that it rises above the horizontal plane when rotated to the nasal side, and sinks below the horizontal plane when rotated to the temporal side.

Dr. Roy O. Riser said that he had seen and heard parts of both these papers in preparation. Seeing the number of cases where there was no improvement and the actual number getting worse, was a matter of chagrin. One wondered why such a group of failures should exist after refraction and the amount of squint treatment that a control group gets. He wondered if it were not due in part to the fact that a certain number of children were seen who had been occluding the eye, in whom a certain improvement would be obtained both in the angle of squint and improvement of vision in the amblyopic eye up to a certain point, then continued to hold to a certain vision. Possibly the point is not sufficiently stressed, or the parents become discouraged in trying to keep a patch on, the occlusion is stopped, and when the patient returns a year or several years later the vision has again dropped. Since observing this, he had stressed the point that children who have apparently arrested improvement—still better than the first vision—should continue to occlude the better eye one full day or one afternoon a week for several years after improvement in vision has stopped, so that it will not decrease. He wondered if the cases that had not improved between the first and last refraction are not cases due to lack of persistent occlusion. If the best results obtained during the several years of active treatment were measured, the group of cases failing to show improvement would be much smaller.

Dr. Elmer A. Vorisek (closing), in reply to the question as to why some cases of strabismus became worse, said that it

was not easy to answer with much satisfaction because the underlying cause of the strabismus cannot always be obtained in very young patients. Some cases do not respond to such treatment as can be given, and if seen at the onset of the strabismus they simply progress and become worse in spite of what is called treatment.

The effect of atropine and occlusion upon amblyopia was not considered to be within the scope of this paper; however, an analysis of the data available indicates an improvement in vision in at least 15 percent. There is reason to believe that when all the records are fairly analyzed the percentage of improvement will be found to be much higher.

Twenty degrees was arbitrarily taken as a dividing line because it was felt that a convergence of this amount or less represented a moderate degree of strabismus, whereas a convergence of 25 degrees or more represented a considerable squint. The degree of binocular fusion was not reported because the entire group had not been so examined. The perimeter was used to measure the squint angle as frequently as possible, but many of the children were either too young or too uncoöperative, and the method described was found the most satisfactory in these cases.

The group herewith reported was not selected and observed for a period of years with the idea of using them for this study. They were the usual group of clinic patients. The records were taken consecutively in order to obtain an unbiased idea of the results of usual or ordinary care.

Dr. George P. Guibor (closing) said, in reply to Dr. Von der Heydt, that no operative procedure should be attempted until the patient is examined frequently and observed for six months or more, and until some form of nonsurgical treatment has been attempted. Bifocals and atropine cycloplegia especially should be used to determine their efficiency in lessening the

angle of squint and in improving the visual acuity.

Dr. Leech asked about a patient with a negligible refractive error with strabismus (one without ametropia, who converges 10 to 20 degrees): such a patient would be called a neuromuscular type in the classification used at Children's Memorial Hospital and Northwestern University. He would still use atropine in such a case to determine the efficiency in suppressing the accommodative convergence.

He thanked Dr. Moncreiff for the suggestion that the oblique plane of rotation be observed: he had seen a number of cases of cycloptropia with esotropia.

There are three types of patches used: in the first, one uses three or four layers of gauze, applied with adhesive tape; the others are made of rubber and can be attached to the lens.

Dr. Ackerman asked whether both eyes were atropinized in a patient with equal visual acuity, and in answer he said that they were. The convergence excess must be overcome as much as possible. In reply to Dr. Mayer's question, he said that for the first four months in the orthoptic clinic only occlusion was used, and the results were very discouraging. There was little improvement in the visual acuity and no improvement in deviation. However, when occlusion was used with atropine and sometimes bifocals, excellent results were obtained, especially in relieving the angle of squint.

Regarding congenital and acquired amblyopia, it is hard to differentiate between the two, although this has been done in the literature. If the patient does not improve it is usually classified as congenital: if he does improve, it is said to be the acquired ex anopsia type.

THE VALUE OF MUSCLE TESTS IN ROUTINE REFRACTION

DR. JAMES E. LEBENSOHN read a paper on this subject which was published in

this Journal (November, 1938).

Discussion. Dr. H. J. Smith wished to call attention to those patients with a refractive error which may include astigmatism. Peter has called attention to the fact that it is often unnecessary to give any vertical correction for hyperphoria: correction of the refractive error will cause the muscle imbalance to correct itself. It is not always necessary to add prisms, base up or base down, when there are lenses of unequal power. The optician may be instructed to raise or lower the optical center to give enough prism effect in the proper direction. He objected to prisms, base in, for exophoria except in older patients, and preferred to use instead exercises for convergence insufficiency arising in early presbyopia. He agreed with the speaker that the best recommendation for any refraction was the satisfied patient, no matter how it is accomplished.

Dr. J. E. Lebensohn (closing) said that Dr. Smith had offered objection to the use of prisms, base in, for convergence insufficiency. In the case cited the lenses with prisms were only prescribed for near work. The patient originally had 15 degrees of exophoria for near; after using the lenses ordered for a year, he then had 6.5 degrees of exophoria: the prisms were then reduced one half, and in the following year the exophoria for near was within normal limits, and reading glasses were prescribed without prisms. He was interested in determining the dominant eye, and any vertically acting prism prescribed is for the nondominant eye. It is surprising how much prism can be so prescribed: in one child with head tilting, 7 degrees, base up, right eye was readily accepted and relieved the condition.

Dr. Halper had objected to overcorrection of myopia at any time. Most of the patients seen were wearing an approximately correct refraction. Because of exo-

phoria still present, a little extra minus was given, and the result justified the procedure. Robert von der Heydt.

LOS ANGELES SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

March 28, 1938

DR. CLIFFORD B. WALKER, *president*

EXPERIMENTAL IONTOPHORESIS ON RABBITS' CORNEAS

DR. S. G. SEECH opened his subject with the statement that ionic medication has been used in ophthalmology since 1900. He stated that the positive ions of zinc, copper, mercury, silver, and quinine were used for their antiseptic properties to promote healing of chronic infections and many kind of ulcers. The negative ions of chlorine, iodine, and salicylic acid were used to soften superficial scars and to promote their absorption.

He contended that the theory of ionic medication was rational, failures being due to improper technique. Imperfect penetration of ions, and formation of insoluble compounds with the plasma result in failure. The application of a galvanic current of two or three miliamperes per square centimeter of surface for a duration of two to three minutes gives the best results. The current should be gradually increased and then gradually decreased. Should the metallic part of the electrode touch any portion of the treated surface, the caustic product formed under the metal electrode will cause tissue damage.

Dr. Seech then proceeded to describe some experimental effects on the corneas of healthy rabbits. He stated that histological methods have shown that the chemical salt solution will enter corneal tissue and be disseminated through it for variable depths, and can even be extended to the posterior pole of the eyeball, in

which case permanent pathological changes result. Naturally from a therapeutic standpoint one should produce only transient changes where the tissues will return to normal after the response to stimulation. The rationale of ionic medication is to promote temporary tissue changes; upon its return to a resting state the rehabilitation of the surrounding normal tissue will commence regeneration in the adjacent diseased tissue.

In the cornea the stimulation causes fluid to be brought and interdispersed in the lamellae. The corneal corpuscles at first respond by becoming mildly edematous, and as this process continues fluid accumulation occurs in the lacunae, and there develops intercellular pressure on the individual fibers and corpuscles of the substantia propria. Repetition of the process periodically produces an alternating irritation and relaxation, which stimulates the tissues in their reparative function.

With zinc sulphate, the healing process is considerably delayed, which makes it necessary to increase the time interval between treatments, allowing sufficient time for return of the inflammatory structures to a normal state after each stimulation. A one-quarter-percent solution with one milliamper current applied for three minutes or less is satisfactory. Stronger solutions consistently induced a tendency to vacuolization in the substantia propria, even to rupture of Descemet's membrane.

Zinc chloride always produced pathological changes even in high dilution, producing marked edema, resulting in bulging of the cornea or ulceration. Hyperplasia of the epithelial elements and inflammatory infiltration of the stroma were found in these cases. On this account the agent was soon discarded.

Physiological salt solution resulted in changes so slight as to be of no therapeutic value.

Colloidal sulphur was found to be unsatisfactory, because particles of sulphur, tending to polarize, formed minute deposits of highly charged irritants in the tissue. Sections showed such peppered areas in the corneal epithelial layer.

Quinine bisulphate was borne by the tissues in concentrations as high as 10 percent for as long as a 10-minute application, with a $2\frac{1}{2}$ milliamper current. Microchemical tests were used to prove its presence in the tissues.

Dr. Seech described the changes occurring in his experiments as follows: The reparative or therapeutic change was that of a superficial reaction not extending past the anterior lamina elastica, and seen as a haziness of the cornea. This is followed by dissemination of ions in the stratified pavement epithelial layer, clinically seen as a powdery, sprayed area with hazy margins. Finally, edema of the corneal corpuscles next to Bowman's membrane which are distorted but do not lose their stellate forms.

The borderline changes Dr. Seech described as varying from mild vacuolization, tending to crush or displace the lamellae, to distortion and rupture of the corneal corpuscles, to finally marked distortion of the fibrillae with edematous fluid. The first stages are probably reclaimable.

Pathologic or destructive changes were described as a diffuse inflammatory infiltration composed of granulocytes, plasma cells, and collagenous histiocytes, all of which are later replaced by lymphocytes. Vacuolization occurs, and the cornea bulges forward. Second, inflammatory hyperplasia of the epithelium and of the posterior lamina elastica occurs. Third, dehydration and subsequent coagulation and necrosis occurs. Finally, reparative fibrosis completes the destructive change.

Dr. Seech then proceeded to describe

two cases of corneal dystrophy which he treated with quinine bisulphate iontophoresis. Both cases showed improvement after several treatments of the one-quarter-percent solution of quinine bisulphate. The first improved in vision from 20/60 to 20/20 and the second from 20/100 to 20/20.

HAROLD F. WHALMAN,
Editor.

MEMPHIS SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

March 8, 1938

DR. C. H. GLOVER, *presiding*

IRIDENCELEISIS FOR GLAUCOMA

DR. E. C. ELLETT reported a case of simple glaucoma for which an iridencleisis had been performed on one eye. In this eye there was very little impairment of the central vision, but the tension was persistently around 40 mm. in spite of miotics, and there was a beginning cataract. The operation was performed a week before, with inclusion of one pillar in the wound. The healing was satisfactory and the tension 11 mm. The other eye also has glaucoma, but the field and vision are normal, and the tension is kept down with miotics. The patient is 66 years old.

In answer to a question as to the choice of operation in this case, it was determined by the fact that there is a beginning cataract and that probably some day a cataract operation will be required.

IRIDENCELEISIS FOR GLAUCOMA

DR. PHIL M. LEWIS presented a white man, aged 65 years, upon whom he had operated for glaucoma three days previously. This patient was first seen in August, 1935, and in spite of the regular use of miotics the tension continued high, O.D. 35 and O.S. 50 mm. Hg (Schiötz).

The visual fields of the right eye were moderately contracted, those of the left eye decidedly narrow. Central vision was 20/100 in each eye, unimproved by lenses. A bilateral iridencleisis had been performed three days ago. The technique was that recommended by Constantine and described by him in the *American Journal of Ophthalmology* for July, 1937.

Comment: The reason for presenting this patient was to bring to the attention of the Society the operation of iridencleisis. The writer has performed quite a number of these operations during the past three years and the results have been so satisfactory that he now prefers it to any other procedure. At first he was extremely skeptical, because he was opposed to any type of operation in which the iris was drawn into and left in the wound, but to date there have been no untoward complications.

DETACHMENT OF RETINA

DR. E. C. ELLETT presented the case of O. W., colored, aged 40 years, who had a cataract operation in 1929 on each eye, and failed to regain vision in the left eye. He had a good visual result in the right eye until July, 1937, when it suddenly failed. Examination showed almost total retinal detachment O.D., although the area up and in was barely loose and retained good color. The disc was not visible. No tear was seen. There was a good upward iris coloboma, with a dense secondary membrane, but good opening.

The outer half of the eye was exposed, the external rectus divided, and about 20 diathermy needles applied to the eye. The sclera was then trephined down and out. On November 20th the fundus was clearly seen and the whole retina reattached. The macular region shows a white scar between it and the disc. On November 6th, O.D. vision was 5/15 with +11.00 D. sph. \approx +1.00 D. cyl. ax. 150°.

HYSTERICAL AMBLYOPIA

DR. E. C. ELLETT reported the case of Sister L. B., aged 29 years, seen September 30, 1937, giving a history of convergence of the left eye and poor vision in it all of her life. There had been no other trouble until sinus disease began four years ago. After two operations on the sinuses she had double vision, relieved by another operation. In July, 1936, she got a piece of glass in the right eye, which was removed by incision. Since then she sees little more than hand motion with the right eye, at best not better than 1/60. There is no inflammation, but the left eye gives her pain. The ophthalmoscopic examination showed a normal condition: pupils equal and active. There is no organic trouble. The left eye converges 15 degrees. The fauces and conjunctiva were anesthetic. Diagnosis: hysterical amblyopia. The right-eye field was contracted to 10 degrees. Rest in bed with occlusion of both eyes for several days gave no results. It developed in conversation that she was very much concerned about the strabismic left eye and thought if it would be straightened her sight could be restored. On November 9th, a recession of the left internus was performed, and her vision was greatly improved the next day. Four days later the next test was made and her vision in both eyes was 6/6.

PODOPHYLLUM KERATITIS

DR. R. O. RYCHENER reported a case of keratitis in a chemist, aged 28 years, which followed closely the accidental instillation in the eye of powdered podophyllum. Within four hours the eye was quite painful and swollen, with acute visual failure. The appearance after 48 hours was that of a deep central keratitis with ciliary injection, and vision was reduced to 3/60. The conjunctival reaction had already receded. The corneal infiltration simulated the character of a disci-

form keratitis, but there was no staining point nor wound of entrance visible with the slitlamp. Local treatment with atropine, dionin, and hot applications was maintained for five days, during which the corneal infiltration cleared rapidly and within a week the vision was 6/6.

This was apparently a specific allergic tissue reaction to a substance which has not been previously responsible for any such reactions, for a recent bibliographic review of the ill effects produced by the dust of the root of podophyllum recorded only one such case. This was reported by Hutchinson (*Medical Times and Gazette*, 1872, v. 2, p. 516) and concerned a case of keratitis and dermatitis produced by powdered podophyllum. A recent query in the *Journal of the American Medical Association* included the report of several cases of gingivitis following the use of capsules containing podophyllum, and the answer raised the question of sensitivity of some additional medicament in the capsules. In the case here reported, no other drug was present and the powdered podophyllum was the sole causative agent in producing the reaction.

OCULAR PAIN

DR. R. O. RYCHENER reported five cases, the chief complaint of each being severe pain in the eye, the cause of each being found at a remote point outside the eyeball. Patients vary greatly in their sensibility to pain, but all these patients were at times in acute distress because of the discomfort described. This small series served to call attention to the ramifications of the sensory fibers of the fifth cranial nerve.

(1) Retained dental root and low basal metabolism. Mrs. B. W. V., aged 45 years, suffered for five years with attacks of pain and a patchy inflammation of episcleritis in the left eye, for which many examinations were made, and a cholecys-

ectomy and hysterectomy were performed without relief. She was known to have an old dental root remaining after an extraction, which her dentist had not seen fit to remove, as the X-ray examination disclosed no infection about it. Re-examination disclosed a low basal metabolism, and thyroid extract was prescribed with immediate improvement generally and marked improvement locally with no return of symptoms. Nine months later the dental root, present for seventeen years, was extracted. In the two years which have followed there had been no recurrence of the ocular pain nor of the inflammations.

(2) Dental pulp stone. Mr. W. A. B., 42 years old, suffered with attacks of lancinating pain in the left eyeball radiating supraorbitally to the parietal region, often necessitating an opiate hypodermically for relief. Numerous general and special examinations including dental and skull X-ray studies were normal. Cocainization of the sphenopalatine ganglion afforded temporary relief. Finally, due to increased sensitivity to electrical stimulation, a sound second molar tooth was extracted, which upon crushing proved to contain a pulp stone. Complete relief had continued during the ensuing eighteen months.

(3) Mucocele in lacrimal sac. Mrs. A. W. Mc., aged 48 years, complained of severe aching and shooting pain in and about the right eye and orbital region. The eye was perfectly normal in every way, but a lacrimal obstruction in the lower end of the duct caused the formation of a small mucocele in the lacrimal sac. There was no visible inflammatory reaction. Mild pressure over the sac evacuated the contents into the nose with prompt relief of the pressure symptoms

which she had related as being in the eye. Fluid could be passed through the duct without probing, and local treatment afforded continued relief.

(4) Brain abscess. A. B., 10 years old, was seen in the hospital following mastoid surgery on the right side, complaining of excruciating pain in the right eye, which would cause him to scream violently and to burrow his head in the pillow seeking relief. There was bilateral papilledema of high degree, and a diagnosis of brain abscess was made and verified by puncture and drainage. Recovery was uneventful, and pain in the eye ceased as soon as the intracranial pressure was relieved. The pain was apparently a reflex one, due to the pull on the dura about the exit of the fifth cranial nerve or its supraorbital branch.

(5) Herpes zoster ophthalmicus. Mrs. J. F. Mc., aged 68 years, was seen at home with disabling pain in and behind the left eye, already present for four days. She had been examined at one of the hospital clinics where no cause was found, and this examination showed nothing to explain the symptoms. The eye was normal to the ophthalmoscope, and there was no tenderness in or behind it on pressure, but severe pain in it persisted day and night. A general physician was called, who found the blood pressure 200/120 and an impending cerebral vascular accident was feared. Eight days after the onset of the pain, her physician reported the presence of erysipelas, which on examination proved to be typical herpes zoster ophthalmicus. Pituitrin and X-ray treatment for the pain were suggested but not used because of family prejudice to such treatment.

J. Wesley McKinney,
Secretary.

AMERICAN JOURNAL OF OPHTHALMOLOGY

Published Monthly by the Ophthalmic Publishing Company

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SEVENTY-FIFTH ANNIVERSARY OF THE AMERICAN OPHTHAL- MOLOGICAL SOCIETY

The year 1864 marked an event of great significance in the history of ophthalmology; namely, the formation of the first society in the United States devoted exclusively to ophthalmology. It was, in fact, the first national medical organization of specialists of any kind in the United States, as far as can be learned.

The occasion is to be celebrated by a special program to which Mr. H. M. Traquair has been invited as special guest. It is interesting that on this anniversary the president should be a Canadian and the official guest an Englishman, significant of our very close relationship to our

neighbor and to our ancestral country.

Some of the early history of the society may be of interest to our readers.

Apparently the idea was first suggested in correspondence between Dr. Hasket Derby of Boston and Drs. Noyes and Bumstead of New York. This was followed by a meeting in Dr. Noyes's office at which there were present Drs. Henry B. Sands, Herman Althof, John H. Hinton, F. J. Bumstead, D. B. St. John Roosa, W. F. Holcomb, Hasket Derby, and Henry D. Noyes. Dr. Sands was elected chairman and Dr. Noyes secretary. Dr. Bumstead suggested that a committee be appointed to invite ophthalmic surgeons from the whole country to assemble in New York at the time of the

meeting of the American Medical Association to form themselves into an American Ophthalmological Association. This suggestion was adopted and Bumstead, Noyes, and Derby were appointed. A proposal to publish a journal was not accepted.

The first meeting was held on June 7, 1864, at the New York Eye Infirmary with 18 in attendance from New York, Boston, Philadelphia, and Poughkeepsie. On the first day the Constitution and By-Laws were drafted and adopted. On the next day, with Edward Delafield presiding, the first paper was read by John H. Dix of Boston on "A case of transparent neoplastic formation in the anterior chamber of an eye." Dix also read a paper on "The effect of Calabar bean upon paralysis of accommodation following diphtheria—1 case."

A publication committee of two was appointed to act with the recording secretary in publishing transactions. A list of active and honorary members was recommended. Dr. Derby exhibited a bottle containing 20 specimens of Calabar bean loaned from an exhibition by a druggist of Boston. A Committee on Publications was appointed. Bumstead and Hinton suggested that at the next meeting be presented "A report on the progress of ophthalmology during the past year." The subject for the next annual meeting was selected: "The morbid conditions functional and organic included under the name Asthenopia, their pathology and treatment."

The second meeting was held on June 13, 1865, at which 20 members were present. Dr. Jeffries of Boston made the "Report on the progress of ophthalmology during the past year," in which Donders's book on accommodation and refraction of the human eye was discussed, as well as ophthalmic photography, autophthalmoscopy, entoptics, and retinal structure.

The long bibliography attached to this report led to the motion that "a committee be appointed to be styled a 'Committee on Ophthalmic Bibliography' who shall prepare a catalogue of books, of journals, and of pamphlets relating to ophthalmology."

The only reference to the war was veiled in the last paragraph of Dr. Jeffries's report as follows: "If, during these times of excitement and anxiety, we American ophthalmologists have not perhaps contributed our share towards the advancement of our science, we shall be pardoned by our medical brethren. We have, at least, by the very formation of this Association, shown that we are anxious to learn, by mutual intercourse and interchange of thought and criticism, and that we ever have in view the one great object of our specialty, the restoration of sight."

Dr. Derby read an account of a case of "Ophthalmia intermittens" thought to be unique of its kind, beginning "Mrs. S. H., aged 59, a lady of full habit and in the enjoyment of perfect health . . ."

Dr. Bumstead offered the following resolution: "This Society shall have the prior right to publish papers read before it, and the authors of such papers shall not publish them elsewhere until after their publication in the Society's proceedings, without the consent of the Publishing Committee, or unless the Publishing Committee fail to insert them in the issue of the proceedings next following their reading; nor in any case shall papers be published as having been read before this Society without the consent of the Publishing Committee."

Dr. Dyer presented a paper, "Asthenopia not connected with hypermetropia," which was discussed at length.

Dr. Noyes read a paper on "Specialties in medicine."

The third meeting was held on June

12, 1866, in Boston with 21 members present. Dr. Henry B. Sands, of New York, read a paper on "Sudden monocular amaurosis, presenting unusual difficulties in diagnosis," the first paper to be illustrated in the Transactions, with four visual fields showing the "Limit of central obscuration" on separate dates. The fields had no axes registering degrees as at present. Another paper on the same subject was presented by Dr. Charles M. Allin (New York). Dr. Ezra Dyer, of Philadelphia, read a paper on "Fracture of the lens of one eye and of the anterior capsules of both eyes, from death by violent hanging." Results observed on this occasion led to experiments with dogs, which were violently hanged and their media observed in comparison with those of the man. An assessment for the coming year of \$10.00 was moved.

At this meeting six new active members were balloted for, among them Dr. John Green of St. Louis, who came from farthest west. The first foreigner, Dr. C. Schweigger, of Berlin, was elected honorary member.

At the fourth meeting, held at Niagara Falls, in June, 1867, Dr. Jeffries of Boston again reported on the "Progress of ophthalmology" for 1865 and 1866. In it he mentions that "the French have filled a gap in ophthalmology in their language; German investigation and study is progressing . . . rendering it all the more mortifying that there does not exist in English a complete work on diseases of the eye, brought down to the present day in ophthalmoscopy and the anomalies of accommodation and refraction; yet Mackenzie's great treatise is translated into French. . . ." The bibliography submitted contained over 50 titles, only two of which were American; namely, the "Transactions of the American Ophthalmological Society, 3d annual meeting, 1865" and H. W. Williams' "Recent ad-

vances in ophthalmic science," Boston, 1866.

A table of "Statistics of 41 ophthalmic hospitals and infirmaries" is given, the various categories including the name of the city, number of inhabitants, founded in what year, surgeons in charge, number of beds, annual number of patients (separate number of house patients), number of days of attendance, average number of days of attendance of each patient, and the important operations: cataract, artificial pupil, strabismus, and others. Five of these hospitals were in the United States—Boston 2, New York 2, Philadelphia 1—all the rest were foreign.

The record of the fifth meeting, held in Newport, Rhode Island, in July, 1868, gives for the first time the roster of members preceding the list of those present: 43 active members, 7 honorary members. Seventeen members were present.

The American Ophthalmological Society through the years has occupied a most important place in world ophthalmology. It has always been composed of outstanding men in this specialty. Obviously in a society with membership so limited that it cannot include more than approximately 5 percent of the ophthalmologists of this country there are a great many very able and distinguished names that do not appear on the roster, but there are few that have ever been there who have not been worthy. The Society has stood for the highest ideals in the profession and has been an example to other groups in its sponsorship of the best in medicine. Long may it live and prosper. The American Journal of Ophthalmology extends heartiest congratulation on this occasion.

Lawrence T. Post.

CATARACT THERAPY

Great indeed would be the jubilation if it could be proved conclusively that cata-

ract was preventable or remediable by nonsurgical procedure. Many efforts have been made to this purpose, some of them genuinely scientific, others crudely empirical. But most ophthalmologists are disposed to believe that no practical benefit has resulted from these investigations.

Medical literature presents a wealth of detail as to the chemical composition of the crystalline lens in man and other animals. Analyses have been made by Krause, Burky and Woods, Jess, and others. A number of studies deal with the immunologic properties of lens protein. The work of Duke-Elder as to the chemical composition of the aqueous humor and its relation to lens nutrition is well known. Salit has written an important series of papers as to his studies of lens composition.

It used to be thought that lens metabolism was of no importance, but a number of recent investigators have demonstrated that the lens consumes oxygen, and that the lens converts glucose into lactic acid. It has been suggested, but not definitely proved, that ascorbic acid (vitamin C) is synthesized by the lens.

As examples of recent essays on the cataract problem we may mention one by Jackson as to the causes of senile cataract (in which it is suggested that deficient hydration may contribute to the formation of lens opacities); papers by Davis and others on dinitrophenol cataract; one by Hess on the production of nutritional cataract in trout; papers by Tainter and Borley, by Derkač, and by Yudkin on the influence of vitamins; one by Givner and Gannon concerning the magnesium content of the lens; and one by Süllmann and Weekers on the origin of galactose cataract.

In addition to the lens changes associated with senescence, cataract occurs in a number of diseases of the general system, including diabetes, atrophic myotonia,

mongolian idiocy, and cretinism. It may also be produced by excessive exposure to infrared rays or by ingestion of such substances as ergot and dinitrophenol.

One of the best recent reviews of the literature concerning metabolic factors in cataract production is that of Bourne, himself a worker in this field of investigation (*Physiological Reviews*, 1937, volume 17, page 1). This author concludes that our actual knowledge of the metabolism of the normal lens is fragmentary, but that investigation of the physical chemistry and metabolism of the lens offers an interesting field for future research.

Those who contemplate devoting their time and energy to this line of experimentation may, however, do well to consider very deliberately whether they can anticipate from such research any substantial benefit to patients afflicted by cataract. In the field of prevention of those types of cataract not associated with senility, a hopeful attitude may be maintained. But, in view of the peculiar physiologic and optical qualities of the crystalline lens, a hopeful attitude seems much more difficult as regards restoration of opaque lens fibers to their normal transparency. Furthermore, the general understanding of senile changes, together with the recent investigations by Alfred Vogt as to the senescence of identical twins, seems to render particularly hopeless the problem of preventing or relieving (by other than surgical measures) those disturbances which we group under the general name of senile cataract.

At the last meeting of the German Ophthalmological Society in Heidelberg (fourth session; see summary in *Klinische Monatsblätter für Augenheilkunde*, 1938, volume 101, page 142) there were read a series of essays dealing with the composition of the lens, the causes of cataract, and the possibility of cataract

therapy. H. K. Müller denied the hopelessness of medicinal treatment, and argued that while "senile death" of the lens could not be ultimately prevented, yet some day it would be possible to find a symptomatic therapy which would influence the speed of development of lens disturbances. Rauh supported the emphasis which Siegrist has elsewhere placed upon the relation between senile cataract and disturbances of the endocrine glands. Urbanek, who had made a series of experiments as to the presence of C-avitaminosis in cataract patients, pointed out that development of cataract in old people was by no means parallel with a noteworthy deficiency in vitamin C, and urged that the relative poverty of the senile organism in vitamin C did not justify a conclusion that cataract development resulted from C-avitaminosis. Bücklers suggested that even metabolic processes, whatever significance might be attributed to them in this connection, were also controlled by the germ plasm (being therefore influenced by heredity).

Vogt, who three months before the last Heidelberg congress had published (see *American Journal of Ophthalmology*, 1938, volume 21, page 1172) what may come to be regarded as one of the classics of medical literature, his essay entitled "Further ocular studies on single-ovum twins of advanced age as to the inheritance of senile characteristics," now (*Klinische Monatsblätter für Augenheilkunde*, 1938, volume 101, page 530) takes up the cudgels against what he regards as the "guesses, hopes, and vulnerable hypotheses" put forward by various authors, especially Müller.

What, asks Vogt, are the environmental influences which Müller regards as playing a part in the development of senile cataract? Vogt's elaborate studies of identical twins disclosed no such influences. The crystalline lens of a man of eighty years may show all the normal charac-

teristics of senility, namely optical density, elasticity, color, and physiochemical composition, yet may remain perfectly clear, although on the other hand heredity may cause complete opacity of the lens at the age of thirty years.

Vogt remarks: "All the innumerable lens therapeutists of this and the previous century, who have instructed the world how to retard and arrest the development of cataract by means of iodine, injections of salt solution, ingestion of lens material, hormones, diathermy, the galvanic current, magnetism, massage, hypnotism, and so on, have without exception adapted their claims to the long established fact that most forms of cataract seem to remain stationary many years or even several decades. . . . Ordinary well water would be preferable to expensive medications."

Vogt expresses the opinion that it is useless to learn the chemistry of hereditary cataract with a view to preventing, improving, or curing it by medicinal means; just as it is useless to study, for a like purpose, the chemistry of senile graying of the hair or of nodular degeneration of the cornea or of hereditary atrophy of the optic nerve.

"Senile characteristics," he says, "are hereditary characteristics, and it is illogical to hope to avoid or correct hereditary characteristics by medicinal treatment."

As regards most discussion as to the causation of senile cataract Jackson says truly that we have "only a sort of underpinning of speculation, instead of any foundation of scientific fact, for our philosophy." But it is the firm opinion of the present commentator that this objection cannot be urged as to Vogt's work. It may even be suggested that no one who has not studied Vogt's detailed observations on identical twins has an adequate basis for conclusions as to the possibilities of cataract therapy. W. H. Crisp.

TUMORS OF THE LACRIMAL SAC

Primary tumors of the lacrimal sac are rare. The writer has seen but one (carcinoma) that seemed to have originated in the sac. When seen it had already involved the caruncle. The then new treatment with X rays (1902) caused the tumor to disappear. But deeper growths in the sac subsequently increased and involved the lacrimal bone and frontal bone. The case ended in death with cerebral symptoms. No similar case was then found in the literature, and the possibility of such tumors has rarely been mentioned in books on ophthalmology.

Penman and Wolff, in the *Lancet* for June 11, 1938, have reported a case in which the growth was excised. Its structure was shown to be that of a malignant papilloma. When first seen there was a small swelling of the sac, feeling like a cyst, and no regurgitation. Five years later the swelling was "the size of a small bantam's egg," and there was no drainage into the nose.

Swelling is often the first convincing sign of disease in the lacrimal passages, calling for surgical interference. But it is not often left to increase for five years, as in this case, and to bring complete obstruction before something is done for it. These authors, from a search of the literature, have now found records of 64 cases. Of these 24 were carcinomas, 20 sarcomas, 7 papillomas, 5 lymphomas, 4 endotheliomas, and the others benign. Tuberculosis and chronic dacryocystitis have been mentioned as causes of tumor of the lacrimal sac, but no individual case histories are reported.

It seems now established that primary tumors of the lacrimal sac occur; and the majority of them were found to have become malignant before they were removed. Failure to report single authenticated cases, and a belief that the sac is protected from many of the influences known to cause cancer elsewhere, have

led to an underestimate of the frequency and importance of such cases. Each case of the kind should be recognized, carefully studied, and reported. This will result in early and general recognition of such cases; and that is the main reliance for the control and prevention of cancer.

Edward Jackson.

BOOK NOTICES

AN EVALUATION OF VISUAL FACTORS IN READING. By Henry A. Imus, A.M., John M. Rothney, Ed.D., Robert M. Bear, Ph.D. Paper binding, 144 pages, Dartmouth College publications, Hanover, New Hampshire, 1938.

This monograph is a preliminary report on an investigation to improve the reading ability of the student body of Dartmouth College. The study was begun in January, 1936, on the freshman class, made up of 636 boys of similar age and qualifications. The Dartmouth Eye Institute made eye examinations of the entire class and errors in refraction were corrected. The eye examination also included tilting-table tests for anisiekonia and measurements of ocular movements in reading with the Ophthalm-O-Graph.

The reading ability of students in relation to education has brought forth much consideration of late. An attempt is being made on this relatively homogeneous group to find what this relationship may be and, if important, how to improve reading ability. The study includes various reading tests and methods to improve reading, in comprehension as well as speed of reading.

This study has been very comprehensive and should be of interest to ophthalmologists and educators. The group is being followed through the four years of college and additional information will follow.

Many of the conclusions are of interest to ophthalmologists. It is interesting that one third of the class had not received adequate ocular care. Ocular defects are not found most frequently among those having reading difficulties and students making low grades. The Ophthalm-O-Graph did not prove a good indicator of reading ability for this study. The extra reading program at Dartmouth is to increase the speed of reading but does not guarantee gain in comprehension in reading or improvement in college grades.

H. Rommel Hildreth.

OBITUARY

WALTER HAMILTON SNYDER

Dr. Walter Hamilton Snyder was born in Elmhurst, Pennsylvania, on September 3, 1870, of Dutch parentage; he died December 29, 1938, at his home in Toledo.

His early life was spent in Scranton, Pennsylvania, and he received his medical degree in 1891 at the University of Michigan, coming to Toledo shortly after to specialize in eye, ear, nose, and throat work. His specialized training was received at various New York and Philadelphia clinics and universities, and several European clinics, notably that of Adelbert Fuchs of Vienna.

From early in his medical career in Toledo, Dr. Snyder took an active part in the activities of the local and state medical societies, serving as councillor, and was on various committees of both organizations. In 1907 he was president of the Toledo Academy of Medicine, and in 1908 and 1909 president of the Ohio State Medical Association. In 1913 he was ap-

pointed by Governor Cox to the Board of the Ohio Commission for the Blind, and continued in this capacity until the early 1920's, when he was made president of this organization, an office he held for many years, proving himself a militant leader for reforms and benefits for the blind.

Many articles pertaining to the eye were written by Dr. Snyder, and he was frequently called upon to address the various county and city medical societies, frequently also such out-of-state organizations as the Chicago and the Detroit Ophthalmological societies. He was always alert to take advantage of new methods for diagnosis and procedure, being the first to perform the Elliott trephine operation for glaucoma in this country, one of the first ophthalmologists in this country to employ the corneal microscope, and one of the first men in Toledo to interest the local profession in the use of the X ray.

During the war he served on a Medical Advisory Committee of Local Physicians for men entering the service. He was a member of the Toledo Academy of Medicine, the Ohio State Medical Society, a Fellow of the American Medical Association, a Fellow of the American College of Surgeons, and a Fellow of the American Academy of Ophthalmology and Otolaryngology.

Dr. Snyder had a great interest in sports, being an ardent hunter and fisherman. He was especially interested in salmon fishing.

He died December 29, 1938, of chronic cardiac hypertrophy.

John D. Skow

In the December, 1938, issue, page 1397, the review of Birch-Hirschfeld's book, "Pathologic anatomy and therapy of trachoma as found in the tarsus and its conjunctiva," was erroneously credited to Dr. L. A. Julianelle. The real reviewer was Dr. Harvey D. Lamb.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens

10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, and history
19. Anatomy, embryology, and comparative ophthalmology

1

GENERAL METHODS OF DIAGNOSIS

Bakker, A. The sodium light in ophthalmology as an aid for unmasking malingers. *Graefe's Arch.*, 1938, v. 139, pt. 2, pp. 267-272.

With the eye alleged to have suffered a diminution of vision always uncovered, the subject successively reads test types illuminated by a green and then a red light while a green and a red glass respectively are placed before the fellow eye. Finally the red glass is replaced by another red glass before the sound eye and the test types illuminated with the sodium light. Now the subject is able to distinguish letters only with the injured eye. Of course, as with all tests for malingering, both eyes must be kept open.

H. D. Lamb.

Busacca, Archimede. Research studies of the eye. *Arch. of Ophth.*, 1938, v. 20, Sept., pp. 395-405.

These technical and practical notes include principles of technique for fixing and preservation of specimens, especially Ruffini's and Bielschowsky's

methods, the removal of corneal tissue for biopsy, and the placing of landmarks on conjunctival or corneal tissue by tattooing. (Photomicrographs.)

J. Hewitt Judd.

Fink, W. H. A method for testing the visual acuity of children. *Amer. Acad. Ophth. and Otolaryng.*, 1937, 42nd mtg., p. 490.

This is a modification of the "E" test.
George H. Stine.

Gassovskii, L. H. The accommodative effort in the use of visual optical apparatus. *Viestnik Opht.*, 1938, v. 13, pt. 3, p. 368.

This investigation deals with the accommodation exerted by the observer in the use of optical apparatus, which is presumably to be applied in a state of ametropia. The study shows that in focusing the ocular the observer does not always set it for his refractive error. Thus subjective determination of refraction dependent on sharp focusing of objects is unreliable. The study also shows that relaxed accommodation required for optimum working conditions with optical devices is not always at-

tained by sharp focusing of the image. The author concludes that optical instruments should have a dioptric scale, so that an observer can set the ocular for his refractive error.

Ray K. Daily.

Hildreth, H. R. Red-free illumination for Bausch and Lomb binocular ophthalmoscope. *Amer. Acad. Ophth. and Otolaryng.*, 1937, 42nd mtg., p. 496.

A small air-cooled mercury arc, operating on the alternating current, is adapted to the Bausch and Lomb binocular ophthalmoscope. (Illustration.)

George H. Stine.

Klimovich, E. F., and Manshutin, M. A. Tests for the determination of visual acuity. *Viestnik Opht.*, 1938, v. 13, pt. 3, p. 382.

This is the first report of the commission to standardize visual tests. The survey of the tests in use leads the commission to conclude that the letters and signs used at present are subtended by different visual angles; that uniformity of results requires uniform conditions relative to illumination, distance, and contrast; that isolated tests afford more accurate information; and that of the tests available Landolt's ring is the best.

Ray K. Daily.

Madroskiewicz, Marion. A keratoscopic attachment for the Simon electric ophthalmoscope. *Klinika Oczna*, 1938, v. 16, pt. 4, p. 457.

The image of a semitransparent Placido disc is reflected from the ophthalmoscopic mirror on to the cornea, and is seen enlarged through a convex lens.

Ray K. Daily.

Natanson, D. M. Diagnosis of tuberculous diseases of the eye. *Viestnik Opht.*, 1938, v. 13, pt. 2, p. 209.

The diagnostic means are focal reac-

tion to tuberculin, X-ray studies of the chest, response to tuberculin therapy, culture of tubercle bacilli from blood or tissues, and typical biomicroscopic changes such as iris tubercles and characteristic corneal precipitates.

Ray K. Daily.

Paulsen and Offret. The gonorrheal complement fixation in ophthalmology. *Bull. Soc. d'Opht. de Paris*, 1937, no. 3, March, p. 157.

The test was without value in conjunctivitis, but of 84 cases of iritis it was positive in 21 per cent. Seven of the cases had definite gonorrheal foci. The test is urged as a diagnostic measure.

Harmon Brunner.

Samoilov, A. I. Focal reaction in ocular tuberculosis. *Viestnik Opht.*, 1938, v. 13, pt. 2, p. 183; and pt. 3, p. 317.

The author is a strong supporter of the use of tuberculin diagnostically to the point of focal reaction. The objective signs of a mild focal reaction should be known and recognized, and severe reactions harmful to the eye should be avoided. Among the early ophthalmoscopic signs of a focal reaction is a movement of the pigment in choroiditic foci. In exudative types of tuberculosis of the posterior ocular segment a focal reaction would be manifested by transitory increase in the retinal edema around the inflammatory foci or the disc. Excessive edema and hemorrhagic reactions should be avoided. The peripapillary edema manifests itself by enlargement of the blind spot lasting for the time of the focal reaction. Such an enlargement can be demonstrated in cases where the increase in retinal edema is too fine to be detected ophthalmoscopically. The author designates enlargement of the blind spot as the campimetric reaction.

A rise in ocular tension 2 to 2½ hours after the tuberculin injection is also a delicate objective sign of a focal reaction. The focal reaction in anterior uveitis may be exudative or hemorrhagic in type; the exudative is manifested by edema of the iris and formation of exudates in the anterior chamber; the hemorrhagic form by hemorrhages in the iris, in the perilimbal vascular network, and in the corneal tissue. These changes can be detected biomicroscopically. (Illustrations.)

Ray K. Daily.

Usefova, F. I. The focal reaction in metastatic ocular tuberculosis. *Viestnik Ophth.*, 1938, v. 13, pt. 2, p. 212.

The author demonstrates the protean manifestations of ocular tuberculosis by means of a series of clinical histories. He contends that the most important diagnostic factor is the focal reaction. This may take the form of fleeting gray tubercles on the pupillary edge of the iris, seen only with the slitlamp. The character of the focal reaction confirms the important role which the ciliary body plays in the pathogenesis of ocular tuberculosis. In disease of the retina or optic nerve the periphlebitic focus may be far in the periphery and inaccessible to ophthalmoscopy. The Mantoux reaction, indicating the degree of local allergy, is helpful in determining the dosage of tuberculin necessary to secure a focal reaction. Ray K. Daily.

Velhagen, K., Jr. X-ray diagnosis in diseases of the eye and its vicinity. *Rev. Oto-Neuro-Oft.*, 1938, v. 13, March, p. 79.

The author points out the value of X-ray diagnosis in diseases of the eye and its adnexa, and he especially emphasizes the value of such diagnosis in intracranial pathologic conditions, such

as pituitary tumor and bony deformities, which give rise to ocular manifestations. He further discusses localization of intraocular foreign bodies after the method of Comberg, the use of radiopaque substances in outlining lesions of the lacrimal apparatus, the value of the Rhese-Goalwin technique for radiography of the optic foramen, and roentgenography of sclerosed cerebral vessels in diagnosis of optic atrophy of the cavernous type without increased intraocular pressure.

Edward P. Burch.

2

THERAPEUTICS AND OPERATIONS

Berens, C. A new keratome. *Amer. Acad. Ophth. and Otolaryng.*, 1937, 42nd mtg., p. 485.

This is a narrow, hollow-ground, angular keratome for paracentesis, iridocapsulotomy, and iridotomy. (Illustration.)

George H. Stine.

Busacca, Archimede. Advantages of use of coagulants in ocular operations, especially in extraction of cataract and in plastic operations. *Arch. of Ophth.*, 1938, v. 20, Sept., pp. 406-409.

The author advocates the use of coagulen, a proprietary coagulant from blood platelets. For enucleation, 20 c.c. of the coagulant is injected into the subcutaneous tissue of the abdominal wall at least two hours before the operation. For other operations the powdered form is applied locally. A dense coagulant forms, producing hemostasis. This is removed before the operation is resumed.

J. Hewitt Judd.

Coulter, J. S., and Carter, H. A. Symposium on physical therapy. Ultraviolet and infrared rays, high frequency currents. *Amer. Acad. Ophth. and Otolaryng.*, 1937, 42nd mtg., p. 78.

This is a comprehensive review of the physiologic effects and application of ultraviolet, infrared, and high-frequency radiation. The authors conclude that the evaluation of methods used in physical therapy must not depend upon the opinion of the physician, but rather the facts that he can demonstrate. Until the effects of these different radiations have been critically evaluated they should be used only as adjuncts to other forms of treatment.

George H. Stine.

Desjardins, A. U. Symposium on physical therapy. The action of roentgen rays and radium on the eye and ear. *Amer. Acad. Ophth. and Otolaryng.*, 1937, 42nd mtg., p. 48.

The author thoroughly discusses the experimental background and clinical radiotherapy, including indications and technique. (Extensive bibliography.)

George H. Stine.

Döhmen, Hellmuth. Bacteriologic and chemical investigations for prevention and treatment of infections of the eye. *Klin. M. f. Augenh.*, 1938, v. 101, Oct., p. 515.

Only in a small percentage of patients is the conjunctival sac sterile. According to frequency it contains staphylococci, streptococci, pneumococci. After experiments with different antiseptics the author found an oily mixture of ethylhydrocuprein and acridin dye superior to other disinfectants in bactericidal action. From good results in several hundreds of cases he recommends the mixture as a prophylactic against infections of the eye.

C. Zimmermann.

El-Bakly, M. A. Iridectomy technique modified to suit iridotomy cases. *Bull. Ophth. Soc. Egypt*, 1936, v. 29, p. 130.

The disadvantages of iridotomy operations with the Graefe knife, De Wecker scissors, and the Ziegler knife are cited, and the author outlines a technique of operation with a keratome incision which he has found useful in cases where the coloboma and pupil are obliterated. Edna M. Reynolds.

Esser, J. F. S. Rotation of the cheek in ophthalmology. *Arch. of Ophth.*, 1938, v. 20, Sept. pp. 410-416.

This plastic operation consists in rotating the loosened normal portion of the cheek combined with more or less skin of the neck for the purpose of restoring the contour of the face after all sorts of mutilation. The large incision around the cheek follows the natural lines of the face. The cheek is utilized to restore the face and the skin of the neck partly covers the cheek. This leaves a large wound in the neck instead of the original one in the face, but owing to the great elasticity of the skin of the neck the wound there can always be closed by sutures. The use of this method in four cases is reported and illustrated by photographs and drawings.

J. Hewitt Judd.

Evans, J. N. An ophthalmic carriage. *Arch. of Ophth.*, 1938, v. 20, Aug., pp. 286-289.

A portable instrument carriage is described which carries the instruments and medications for bedside dressings and examinations, charts for testing visual acuity, a hammer lamp, and, in fact, all accessories needed for a complete ophthalmoscopic examination. Photographs and a list of the 32 items of equipment carried are included in the article.

J. Hewitt Judd.

Magitot, A. Acute intolerance for atropin. *Bull. Soc. d'Opht. de Paris*, 1937, no. 3, March, p. 168.

Violent reaction occurred from one-percent atropin, so skin tests were made elsewhere on the body. Some of the tests provoked a general reaction. No reaction occurred from buccal applications. Because of the eosinophilia the author prefers the term "sensitivity" to "idiosyncrasy." Various means of desensitization were tried without avail.

Harmon Brunner.

Promptov, V. A. Substitution of naphthocaine for cocaine. *Viestnik Ophth.*, 1938, v. 13, pt. 1, p. 115.

Naphthocaine is one of the Russian preparations designed to eliminate importation of cocaine. The report of this laboratory study shows that it acts more rapidly, and withstands boiling better than cocaine; that it does not dilate the pupil, raise ocular tension, or exfoliate the corneal epithelium. It is somewhat more disagreeable than cocaine.

Ray K. Daily.

Russo, Antonio. The action of "veritol" upon the eye. *Rassegna Ital. d'Ottal.*, 1938, v. 7, May-June, pp. 328-337.

Veritol, β (p-oxyphenyl) isopropyl-methylamine is a synthetic product of the adrenalin series. It raises blood pressure and increases the hemodynamics of insufficient circulation. Beyond this the mechanism of its action is complex and not well understood. Dropped into the conjunctival sac in 3-percent solution, veritol produces mydriasis and widening of the palpebral fissure. The duration of its action is much less than that of other mydriatics, and it does not abolish the pupillary reflexes. It is well tolerated by the tissues and does not modify corneal sensibility, nor alter intraocular tension or refraction. The drug is an excitant of the sympathetic.

Eugene M. Blake.

Scheyhing, Hans. Experimental investigations as to the action of short waves on the normal and infected eyes of rabbits. *Klin. M. f. Augenh.*, 1938, v. 101, Sept., p. 327.

The normal eye of the rabbit is not injured by radiation with short waves at a heat tension of 17.5. Increase to 18 leads to transient opacities of the corneal surface and serious reactions in the lids. Experimental ulcers of the cornea, and suppuration in the anterior chamber caused by staphylococci, were benefited by radiation with short waves of correct dose, but abscesses of the vitreous were not influenced by such treatment.

C. Zimmermann.

Theodore, F. H. Hypersensitivity to larocaine. *Arch. of Ophth.*, 1938, v. 20, Sept., pp. 474-476.

A woman, aged 70 years, twice developed bulbar and palpebral conjunctival reactions and catarrhal corneal ulcers and infiltrates after the use of a 2-percent solution of larocaine for local anesthesia before an application of silver nitrate. A patch test on the arm gave a positive reaction. No ill effect from the drug has been reported previously.

J. Hewitt Judd.

With, T. K. The metabolism of vitamin A and the carotinoids in warm-blooded animals; their absorption from the intestinal canal and deposition in the tissues. *Hospitalstidende*, 1938, v. 81, Nov. 29, pp. 1128-1149.

This very thorough and detailed review of the literature on the subject includes several pages on the metabolism of vitamin A in relation to visual purple and to vision.

D. L. Tilderquist.

3

PHYSIOLOGIC OPTICS, REFRACTION,
AND COLOR VISION

Bari, Enzo di. Consideration of near vision in the myopic eye. Graefe's Arch., 1938, v. 139, pt. 1, pp. 165-179.

The subject is treated analytically both for the reduced eye of Listing-Donders and for the schematic eye of Gullstrand. H. D. Lamb.

Ciocchi, A. Changes in the types of visual refractive errors of children. Public Health Reports, 1938, v. 53, Sept., pp. 1571-1578.

In a group of 1,481 school children, the author found that the main type of refractive error under cycloplegic, on re-examination after an average interval of almost 2½ years, remained unchanged in 75 percent of the eyes. The frequency of simple hyperopia was reduced by 20 percent while that of astigmatism (hyperopia and myopia) increased 40 percent and of simple myopia 70 percent. The chances of a change in type of refractive error appeared to decrease with age.

T. E. Sanders.

Cori, R. de. New methods for interpretation of the visual phenomenon. Graefe's Arch., 1938, v. 139, pt. 1, pp. 80-84.

With the single exception of the retinal purple in the rods, none of the theories for vision harmonizes with present histologic and microchemical knowledge of the retina. Light perception depends much more upon the light stream entering the eye, without regard to whether a larger or smaller expanse of the retina is affected by this light stream. The author cites a case in which extensive preretinal paramacular hemorrhage produced no scotoma. This

state of affairs can only be explained by the action of the horizontal and associated amacrine cells.

H. D. Lamb.

Cotlier, I. Biastigmatism of Marquez. Rev. Oto-Neuro-Oft., 1938, v. 13, Feb., p. 33.

The author describes in some detail the method of Marquez for correction of the total astigmatic error, employing bicylindric lenses. The corneal astigmatism is determined by the keratometer and the balance of the astigmatic error is uncovered by means of astigmatic dials, the total error being resolved into a single cylindric correction. (See editorials, Amer. Jour. Ophth., 1930, v. 13, p. 906; and 1931, v. 14, p. 160.) Edward P. Burch.

Dudinov, S. A., and Zepenuk, L. M. Changes in refraction following excision of pterygium. Viestnik Ophth., 1938, v. 13, pt. 1, p. 100. (See Section 5, Conjunctiva.)

Eidelman, B. M. A comparison of Stilling and Ishihara plates of Soviet and foreign manufacture. Viestnik Ophth., 1938, v. 13, pt. 1, p. 124.

The investigation shows that the Kharkov edition of the isochromatic plates is as accurate as the foreign editions. Ray K. Daily.

Essen, J. The idea and significance of photic obscurity. Graefe's Arch., 1938, v. 139, pt. 1, pp. 105-117.

Obscurity means lack of optical differentiation in space. There are blind individuals whose vision is still so much a true experience that they see an obscurity. These include the psychogenically totally blind, as from hysteria. Other blind persons see nothing and also very probably recognize no ob-

scurity. In the same sense, the so-called blind spot of the eye is not truly blind. With it, obscurity is not recognized; nothing is seen. It is a true negative scotoma. All obscurity has its color, otherwise it would not be obscurity but lack of sight. There exists not only a dull black and a bright white obscurity but also a colored one. The phosphenes observed by pressure on the eyeballs with the eyelids closed are examples of this.

There are lower animals, as the worms and insects, whose only optical experience must be that of photic obscurity. The photosensitive light organs of these animals must be distinguished from the visual organs of higher sighted animals.

H. D. Lamb.

Franke, Ernst. Bodily build and refraction. *Klin. M. f. Augenh.*, 1938, v. 101, Aug., p. 184.

About 500 myopes, emmetropes, and hypermetropes were examined at the dispensaries of the Berlin eye clinic with regard to bodily build and growth. Among myopes leptosomatics, and among hyperopes pyknotics, were more numerous. On the average the height of the myopes was 3.3 cm. greater than that of the hyperopes. The head index in the hyperopes was higher than in the myopes. The mean values of bodily index according to Kaup and Rohrer were less in myopes than in hypermetropes. Thus the structure of the body in myopes is predominantly more slender, in hypermetropes broader. In high myopia the medium values of bodily size seems to decline, and short, heavy-set, even dysplastic types are more frequent. So-called growth myopia, mostly of low degree, appears at school age, chiefly in tall slender persons. The deleterious forms of myopia

noticeable in early youth are more frequent in individuals of short, even dysplastic bodily structure.

C. Zimmermann.

Haass, K. E. Photokinetic theory of the shadow test. *Graefe's Arch.*, 1938, v. 139, pt. 2, pp. 247-266.

The author presents geometric diagrams and formulae to explain the phenomena of skiascopy. The designation of this procedure as skiascopy or the shadow test is not justified by the author. The method can correctly be designated only as photokinesis, that is, a test of the refractive condition by means of the movement of a bright field.

H. D. Lamb.

Hardy, L. H. A modified accommodation rule. *Amer. Acad. Ophth. and Otolaryng.*, 1937, 42nd mtg., p. 493.

This is a modification of Crampton's rule, the improvements being a swivel head and three new scales. (Illustration.)

George H. Stine.

Heinsius, Ernst. Simple uncomplicated form of congenital total color-blindness. *Klin. M. f. Augenh.*, 1938, v. 101, Oct., p. 489.

A man of eighteen years showed uncomplicated total color blindness without impairment of vision, macular changes, photophobia, or nystagmus. Hence it is suggested that the seat of this condition is probably not in the retina but in a higher sensory center.

C. Zimmermann.

Jaeger, Ernst. Investigations on school myopia. *Klin. M. f. Augenh.*, 1938, v. 101, Aug., p. 205.

From 1926 to 1935 the pupils of two schools were annually examined with regard to refraction. From the twelfth year myopia very frequently began.

After the fifteenth year generally no myopia developed. Between the second and third school years myopia was found very frequently with a tendency to increase. Hence a correlation between age, bodily development, and onset of myopia was assumed, whereas no relation could be found between the mental requirements of the school and the genesis of myopia. Less favorable hygienic conditions (living, sleeping, and schoolrooms) probably promote myopia. The total results indicate that the influence of the laws of development and growth predominates over that of environment.

C. Zimmermann.

Karels Kazimierz. The physical and biologic limitations of vision. *Klinika Oczna*, 1938, v. 16, pt. 4, p. 407.

A philosophic dissertation on the interrelation between visual perception of external environment and the internal psychologic processes initiated by external visual impressions. The importance of the visual organ in the development of intelligence is emphasized.

Ray K. Daily.

Kravkov, C. V. The effect of dark adaptation on the critical frequency of flickering monochromatic light. *Viestnik Opht.*, 1938, v. 13, pt. 1, p. 72. (See *Amer. Jour. Ophth.*, 1938, v. 21, Dec., p. 1407.)

Lebensohn, J. E. Value of muscle-balance tests in routine refraction. *Amer. Jour. Ophth.*, 1938, v. 21, Nov., pp. 1259-1263.

Malbran, J., and Adroque, E. Unilateral diplopia. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, March, p. 140.

The literature of monocular diplopia is reviewed and its methods of produc-

tion are discussed. The authors report three instances of convergent strabismus in which extrafoveal fixation had developed from abnormal retinal correspondence, binocular triplopia resulting.

Edward P. Burch.

Morawska, Maria. Skiascopically determined difference in refraction on the optic nerve and on the macula. *Klinika Oczna*, 1938, v. 16, pt. 4, p. 447.

A report of the literature and of the author's own investigations on 233 cases. Her data show an inconstant difference between the refraction of the optic disc and of the fovea. This occurs more frequently in hyperopia and astigmatism, and less frequently in myopia and emmetropia. It is independent of fundus changes and of the amount of the refractive error. In doing skiascopy it is important to skiascope the macula.

Ray K. Daily.

Paul, Ludwig. Observations on the hereditary occurrence of myopia. *Communication 1. Graefe's Arch.*, 1938, v. 139, pt. 2, pp. 378-402.

The author reports on over 4,000 individuals belonging to 878 families. Where both parents are emmetropic, at the most only 10 percent of the first filial generation are myopic. If one parent is myopic, this percentage of myopia in the offspring increases to 30 percent, and when both parents are myopic to 60 percent. In affected families, there are about 12 percent more myopic men than myopic women among the descendants. High degrees of myopia, however, occur more often in women than in men. A sufficient number of mothers with high myopia are observed to establish that in families with highly myopic mothers, many more 'highly' myopic children occur than in families where the mothers are

emmetropic or mildly myopic, whereas a particular frequency of mild myopia in the offspring of these families does not occur.
H. D. Lamb.

Rosenberg, I. H. A comparative evaluation of tests for color vision. *Viestnik Opht.*, 1938, v. 13, pt. 2, p. 281.

A comparative evaluation of Stilling, Ishihara, and Rabkin plates. The conclusions are that the Stilling plates are inferior to the Ishihara and Rabkin plates, and that the Rabkin plates afford a finer differential diagnosis than the Ishihara plates.
Ray K. Daily.

Scheidt, Walter. New investigations in physiologic optics and the psychology of vision. *Graefe's Arch.*, 1938, v. 139, pt. 1, pp. 85-96.

The basis for the general principles of the neurophysiology of vision may be summarized in the synallax (associated changing) theory. This implies that the nervous system does not conduct the change (which is produced in an organ by a stimulus) but connects together several such organs and serves to balance the difference in the conditions between the affected and unaffected organs. The processes in these organs are therefore not to be considered as stimulations but as incidences (light incidence, sound incidence). The author discusses the function of the retina, the optical image in the retina, color vision, achromasia, chromanopsia, the movements of fusion and the first space dimension, the static function of the eye and the second space dimension, perception of form, the minimum visible, and the minimum separable.
H. D. Lamb.

Sivko, M. T. A comparative evaluation of the German and Russian editions of the Stilling plates. *Viestnik Opht.*, 1938, v. 13, pt. 2, p. 288.

There is no difference between the findings obtained with the two editions of these plates.
Ray K. Daily.

Sobhy Bey, M. Contact glasses. *Bull. Ophth. Soc. Egypt*, 1936, v. 29, p. 181.

Contact glasses, their advantages, therapeutic uses, and method of prescription are described.

Edna M. Reynolds.

Tschermak-Seysenegg, Armin. A double-slit system with wave-length constants for mixing spectral lights. *Graefe's Arch.*, 1938, v. 139, pt. 2, pp. 232-246.

A double-slit system is described, as devised by the author and constructed by J. J. Fric. This apparatus insures the attainment of a pair of spectral colors which strongly maintain their average wave length in all changes either of width of slit or of intensity of the mixed color relations. To do this, on the one hand, consideration must be given to the interval between both rays in the spectrum; and on the other hand the slit width of the single slit must be the sum of the widths of both components in as wide limits as desired and continuously graduated.
H. D. Lamb.

Tschermak-Seysenegg, Armin. Observations with the neutral-light tester. *Graefe's Arch.*, 1938, v. 139, pt. 2, pp. 181-231.

The neutral-light tester, devised by the author and manufactured by the Zeiss company, is described. It consists basically of a large right-angled spectroscope with a lamp producing a point of light. With this apparatus, there can be exposed to the testing lamp at one time a field with homogeneous radiation from a spectrum of a very strong dispersion, at another time (by means of an adjusting screw)

a field of undispersed light. Three spectral cardinal points (primary yellow, primary green, primary blue) are determined both by the neutral fixed eye (after exclusion of light for 3 minutes) and by the action of the light of the testing lamp. With the insertion of a double-slit system (according to Hering or Tschermak-Seysenegg), the missing primary red of the spectrum can be brought into the examination. The principles of color determination are retested and confirmed. It is demonstrated that the cardinal colors are displayed by changing the light, so that in subjective mixtures of colors all four cardinal points are deranged. In subjective primary coloring on the other hand, there follows only a displacement of both adjacent dissimilar cardinal colors, and not of the primary color concerned or of its complementary color. The tester is particularly appropriate for examination of red-green blindness.

H. D. Lamb.

With, T. K. The metabolism of vitamin A and the carotinoids in warm-blooded animals; their absorption from the intestinal canal and deposition in the tissues. *Hospitalstidende*, 1938, v. 81, Nov. 29, pp. 1128-1149. (See Section 2, Therapeutics and operations.)

4

OCULAR MOVEMENTS

Alvaro, M. E. Treatment of concomitant strabismus. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 1, pp. 355-356.

The author emphasizes the necessity of correcting errors of refraction as early as possible. Inasmuch as many squints are manifested during stages of organic weakness, the organism ought to be strengthened by tonics, vitamins, and so on. Once the deviation

has become permanent, surgery ought to be the treatment of choice. The technique varies according to the experience of the surgeon. However, the author does not favor free tenotomies, but advocates recession.

Ramon Castroviejo.

Berens, C. A new type of Maddox rod. *Amer. Acad. Ophth., and Otolaryng.*, 1937, 42nd mtg., p. 487.

This simple, inexpensive, and indestructible rod is made both with and without a prism. (Illustration.)

George H. Stine.

Bielschowsky, A. Disturbances of the vertical motor muscles of the eyes. *Arch. of Ophth.*, 1938, v. 20, Aug., pp. 175-200; also *Trans. Western Ophth. Soc.*, 1938, 5th mtg; also *Acta Ophth.*, 1938, v. 16, pts. 2-3, p. 235.

The physiologic action of the vertical motor muscles is reviewed and the disturbances of these are discussed in five groups: (1) pure concomitant vertical deviations, (2) vertical deviations of parietic origin, (3) deviations that show the features of unilateral or bilateral overfunction of the inferior oblique muscle, (4) dissociated vertical deviations, and (5) vertical deviations having the combined characteristics of several of the other groups. The difficulties in differential diagnosis are outlined and illustrated by three case histories. The author warns that in cases of vertical deviations one should always bear in mind the possible complications with spastic vertical divergence innervations and should try to follow their signs in order to prevent unexpected and undesired operative results.

J. Hewitt Judd.

Bielschowsky, A. Lectures on motor anomalies. 2. The theory of hetero-

phoria. *Amer. Jour. Ophth.*, 1938, v. 21, Oct., pp. 1129-1136.

Bielschowsky, A. Lectures on motor anomalies. 3. The signs and symptoms of heterophoria. *Amer. Jour. Ophth.*, 1938, v. 21, Nov., pp. 1219-1229.

Blobner, Ferdinand. Retractory nystagmus. *Klin. M. f. Augenh.*, 1938, v. 100, Aug., p. 238.

Retractory nystagmus consists of jerky retractions of the eyeball during intentional ocular movements. They cannot be explained by pathologic changes in the orbit. According to Elschnig they are caused by diffuse pressure on the intact nuclei of the ocular muscles in the region of the aqueduct of Sylvius and their connecting fibers, and on the posterior longitudinal bundle; leading to disturbed innervation of gaze, so that in every intentional movement of gaze the voluntary impulse affects all extrinsic ocular muscles. The correctness of this localization has been proved by operative and postmortem findings. Only twelve cases have been published. The case now reported was in a man of 62 years who had been suffering for about four years from attacks of vertigo in which he fell on his occiput, with loss of consciousness and slight hemiplegia. The author assumes a traumatic genesis from hemorrhages in the region of the corpora quadrigemina. C. Zimmermann.

Frogé, Poursines, and Chiniara. Bilateral paralysis of both internal-rectus muscles, and of the iris muscles. ("Lobster eyes.") *Bull. Soc. Franç. d'Opht.*, 1937, v. 50, pp. 261-263.

The patient was a 48-year-old woman, seen four years after onset of the disease. There were spinal-fluid findings that might indicate an inflamma-

tory origin, and localization of the trouble in the course of the third nerve through the leptomeninges.

Clarence W. Rainey.

Fronimopoulos, J. A contribution to the question of etiology of so-called rheumatic paresis of the abducens. *Klin. M. f. Augenh.*, 1938, v. 101, Aug., p. 253.

Urbanek presents two cases of isolated paresis of the abducens due to circumscribed tuberculous meningitis and urges that in so-called rheumatic paresis of the abducens (etiology unknown) one must think of a tuberculous etiology. One case suggested an inflammatory process in the posterior cranial fossa. In the second case a positive tebeprotein reaction indicated tuberculosis at the apices of the lungs, and the tuberculous etiology of the abducens paresis was supported by recovery following injections of tebeprotein.

C. Zimmermann.

Hardy, L. H. A modification of the four-dot test. *Amer. Acad. Ophth. and Otolaryng.*, 1937, 42nd mtg., p. 491.

This modification is portable and adaptable for near-point work. It is not intended to supplant Worth's test. (Illustration.) George H. Stine.

Hardy, L. H. Synoptophore slides. *Amer. Acad. Ophth. and Otolaryng.*, 1937, 42nd mtg., p. 494.

This series of targets for use in the major amblyoscopes comprises a testing group and a training group. The training group includes the most effective of several hundred slides already in use. (Illustration.)

George H. Stine.

Lijo Pavia, J., and Victoria, V. Concomitant strabismus. *Rev. Oto-Neuro-Oft.*, 1938, v. 13, April, p. 95.

This article is a review of the results of tenotomy in the correction of concomitant strabismus in a series of thirty cases. The authors conclude that tenotomy alone is sufficient to achieve parallelism of the visual axes in 50 per cent of the cases, that it may be sufficient even in extreme degrees of squint, that tenotomy alone should be performed before employing other procedures, and that exophthalmos occurs in only a small percentage of tenotomized eyes. Edward P. Burch.

Marquez, M. Secondary deviation in various kinds of strabismus, especially spasmodic strabismus. *Bull. Soc. Franç. d'Ophth.*, 1937, v. 50, pp. 254-260.

The secondary deviation in the case of concomitant strabismus is equal to the primary deviation, since there is no difference in the intensity of the nervous current descending from the ocular gyrus to the two muscles. In paralytic strabismus, the secondary deviation is greater than the primary, because the nerve current must go entirely to the sound muscle corresponding with the paralyzed one, since the pathway to the paralyzed muscle is blocked. In spasmodic strabismus the secondary deviation is greater than the primary, but is less than the secondary deviation occurring in complete paralysis. Clarence W. Rainey.

Maxwell, J. T. Nature and management of the heterophorias. *Arch. of Ophth.*, 1938, v. 20, Sept., pp. 375-383.

This discussion deals with the nature and importance of tonic innervation (which is relatively stable), fusional reserve (which varies greatly not only with the condition of the general system but as a result of orthoptic training and other influences), innervation at the reading distance, management of

heterophorias by orthoptics and prisms, and measurement of convergence efficiency. Most difficulties in ocular-muscle imbalance arise from deficient positive fusional reserves at the reading distance. J. Hewitt Judd.

Ohm, J. Contribution to nystagmus. Communication 45. *Graefe's Arch.*, 1938, v. 139, pt. 2, pp. 367-377.

Five new cases of total color blindness show the path of oscillation of the anterior corneal pole or of the optic nerve, when the gaze is fixed straight anteriorly, to be horizontally, slightly obliquely, diagonally circularly, or elliptically shaped. In the last the rotation may be clockwise or counterclockwise. These movements are usually different or dissociated as between fellow eyes. When looking other than straight ahead, the path of oscillation may change. The preponderant nystagmus in the color-blind and in miners is pendulum nystagmus.

H. D. Lamb.

Shaad, D. J. Binocular vision and orthoptic procedure. *Arch. of Ophth.*, 1938, v. 20, Sept., pp. 477-501.

The physiologic basis for binocular vision and the clinical diagnosis of its anomalies are briefly reviewed and the orthoptic procedures discussed in detail. The author points out the need for controlled laboratory research in this field. J. Hewitt Judd.

Travers, T. àB. Suppression of vision in squint and its association with retinal correspondence and amblyopia. *Brit. Jour. Ophth.*, 1938, v. 22, Oct., pp. 577-604.

The author discusses the subject under the following heads: the nature of suppression in squint; the color test; the mirror-screen test; suppression and

confusion; suppression in abnormal retinal correspondence; suppression, retinal correspondence, and visual acuity; the grade of binocular vision, abnormal retinal correspondence, normal and abnormal binocular vision. Methods are described and cases presented. Suppression does not always produce amblyopia. Abnormal correspondence prevents the development of amblyopia. A scheme of the development and grades of binocular vision concludes the article. The author suggests that tests such as the synoptophore method or the mirror screen are the best methods of diagnosing abnormal correspondence and measuring the angle of anomaly. (Figures, bibliography.)

D. F. Harbridge.

5

CONJUNCTIVA

Attiah, M. A. H., and El-Tobgy, A. F. A review of the treatment of trachoma. *Bull. Ophth. Soc. Egypt*, 1936, v. 29, p. 97.

Various types of general and local treatment are described and evaluated. General treatment by antifollicular injections has no value and induction of general or local immunity by sera or vaccines seems of doubtful value. The only benefit in general treatment is from removal of focal sepsis.

The means of local treatment which are most useful are the salts of copper, mercury, and silver. Massage with chaulmoogra oil forms part of the routine treatment of trachoma in Egypt. It is alternated with the use of 10-percent copper sulphate. Hydnocreol and copper sulphate have the same effect as chaulmoogra oil with copper but appear to be more effective in cases where there is discharge.

Heliotherapy and electrotherapy have

been found unsatisfactory, but the use of the thermophore in pannus cases gives replacement of pannus by fine nebulae with improvement in vision. Treatment with radium is not permanent and is not superior to copper. Local ultraviolet radiation gives no better results than ordinary treatment.

Mechanical treatment is practiced as a routine. The mechanical treatment of choice is expression of follicles with Graddy's forceps. Mechanical treatment is repeated until complete scarring or cure occurs.

Edna M. Reynolds.

Benalioua. Primary tuberculous infection of the conjunctiva. *Ann. d'Ocul.*, 1938, v. 175, Oct., pp. 746-772.

Tuberculographers have long been interested in studying the portal of entry of tuberculosis, not only in the lungs, but also in the mucous membranes, skin, and conjunctiva. This paper is an extensive review of the conjunctival aspect of the problem. Primary infection by this route is relatively rare, but has been recognized in the literature since 1879. The author collected 181 cases of tuberculosis of the conjunctiva, 62 being apparently primary lesions, and nearly all in children or young women. At the site of inoculation a subacute conjunctivitis develops, with minimal symptoms but an accompanying adenopathy. The conjunctivitis may be nodular, ulcerative, vegetative, or pseudomembranous. The preauricular gland becomes swollen and often caseous. Later the glands of the neck are involved. In the early cases there is no evidence of systemic tuberculosis and the tuberculin test is negative. Diagnosis rests on recovery of the tubercle bacillus from the conjunctiva and exclusion of syphilis, soft chancre, glanders, tularemia, and sporotrichosis.

In spite of general opinion, the prognosis is really fairly good. Mild and expectant local treatment should be accompanied by general measures. (Extensive bibliography.)

John M. McLean.

Bietti, Giambattista. Melanotic conjunctival concretions after prolonged instillation of adrenalin. *Boll. d'Ocul.*, 1938, v. 17, Feb., pp. 65-79.

The writer reports two cases. A man of 29 years, affected by spring catarrh, had instilled adrenalin in both eyes six or seven times a day for the preceding seven years. A woman of 32 years, also affected by spring catarrh, had instilled adrenalin in the left eye every hour for seven months. In each case the palpebral and bulbar conjunctiva showed numerous black granules which upon histologic examination proved to be conjunctival concretions of the type found in chronic conjunctivitis. In these the melanin was deposited. (Bibliography, 8 figures.)

Melchior Lombardo.

Borsello, G. Anatomical pathology of the trachoma granule. *Rassegna Ital. d'Ottal.*, 1938, v. 7, May-June, pp. 361-407.

Borsello presents an extensive bibliographic review and describes the pathologic anatomy of the various elements which constitute the trachoma nodule. He concludes that one must admit the prolonged action of a stimulus by an unknown agent, or by a toxin of its production, in which the conjunctival tissues react with hyperplasia of their lymphatic components. A clear expression of this hyperplasia is the formation of nodules, with follicles secondarily activated, of histiocytic nature. The morphologic picture, the evolution, and the decline of this hyper-

plastic formation lead one to assign to it an inflammatory character and the significance of a granuloma. (12 figures.)

Eugene M. Blake.

Braley, A. E. Inclusion blennorrhea. *Amer. Jour. Ophth.*, 1938, v. 21, Nov., pp. 1203-1207.

Claessen, Leontine. A case of simulation. *Bull. Soc. Belge d'Opht.*, 1938, no. 76, p. 27.

A little girl simulated conjunctivitis on several occasions. Ultimately a few orange pips were discovered in the lower cul-de-sac. The motive was uncertain.

J. B. Thomas.

Cossu, Giovanni. Acute conjunctivitis caused by micrococcus catarrhalis. *Rassegna Ital. d'Ottal.*, 1938, v. 7, May-June, pp. 351-360.

Cossu describes the morphologic, cultural, and biochemical characteristics of micrococcus catarrhalis, the gonococcus, and the meningococcus, and their differentiation. He describes three cases personally observed and concludes that the following changes are characteristic of this infection: tumefaction of the lids, more or less pronounced, with lid margins covered by yellowish crusts; the palpebral conjunctiva always reddened and swollen, with frequently a velvety appearance and at times covered by a pseudomembrane easily removed; abundant yellowish secretion; cornea never involved. Recovery occurs within a few days and is hastened by argyrol and later zinc-sulphate drops. Routine examination of the secretion in all cases of conjunctivitis is urged.

Eugene M. Blake.

Derkač, V. Antimony in trachoma. *Klin. M. f. Augenh.*, 1938, v. 101, Sept., p. 418.

The author had such good results from intravenous injections of one-percent antimony in trachomatous pannus that he uses the treatment regularly in his practice. The Weil-Félix reaction became negative after treatment with antimony. Like results followed injections of antimony-Fuadin and neostibosan. The method is contraindicated in patients with a tendency to lung affections, because it causes an irritating cough. C. Zimmermann.

Derkač, V. The question of rickettsias in trachoma. *Klin. M. f. Augenh.*, 1938, v. 101, Aug., p. 247.

Recent tests by Pöstić of 100 trachoma patients with the Weil-Félix reaction confirm the results reported by Derkač (see *Amer. Jour. Ophth.*, 1938, v. 21, p. 464). Further observations lead the author to the probable conclusion that trachoma is a rickettsia disease, as argued by Busacca, Cuénod and Nataf, and others. The impression that the trachoma rickettsias are related to those of typhus fever, is confirmed by the positive Weil-Félix reaction. There are several groups of trachoma rickettsias, and perhaps each endemic area has a different variety, each giving a different titer of agglutination. Trachoma is propagated from man to man directly through rickettsias contained in tears, and indirectly by transmission through infected lice. People afflicted with lice infect their eyes by rubbing them with fingers contaminated by the feces of lice in which rickettsias are contained. Local rickettsiosis must be distinguished from general rickettsiosis. Trachoma is local rickettsiosis which may occur without the agency of lice. General rickettsiosis gives a positive Weil-Félix reaction, is produced by infection from louse bites, and may thus occur in healthy nontrachomatous per-

sons. Pannus is a symptom of general rickettsiosis. In 95 percent of the cases it appears after antimony injections. A combat against endemic trachoma calls for complete freeing of the infected district from lice as a prerequisite.

C. Zimmermann.

Dudinov, S. A., and Zepenuk, L. M. Changes in refraction following excision of pterygium. *Viestnik Opht.*, 1938, v. 13, pt. 1, p. 100.

A tabulated report of the changes in 21 patients. The conclusion is that pterygium reduces visual acuity by causing horizontal flattening of the cornea. Surgical removal of the pterygium is followed by improvement in visual acuity. (Illustrations.)

Ray K. Daily.

El-Bakly, M. A. Treatment of trachoma. *Bull. Ophth. Soc. Egypt*, 1936, v. 29, p. 88.

Nonoperative and operative treatments are outlined for all stages of trachoma and for its numerous complications. Prophylactic measures as carried out in the hospitals are enumerated and the educational program for outpatients is stated.

Edna M. Reynolds.

Fazakas, Alexander. Meibomian conjunctivitis caused by acrothecium hominis Oláh. *Klin. M. f. Augenh.*, 1938, v. 101, Sept., p. 387.

A patient had been under treatment for a long time. The lower lid was thickened and concretions could be expressed from the enlarged openings of the meibomian glands. These proved to be pure cultures of a fungus, *acrothecium hominis* Oláh. Implantation in the eyes of rabbits gave positive results. After five relapses the fungi disap-

peared, and the chronic irritation subsided under proper treatment.

C. Zimmermann.

Friede, Reinhard. Conjunctival graft of the entire conjunctival sac with insertion of a glass shell in total symblepharon as the result of chronic pemphigus. *Graefe's Arch.*, 1938, v. 139, pt. 2, pp. 323-324.

In the case of a 67-year-old man with bilateral total symblepharon and corneae cicatrized, dry, and opaque from pemphigus, the entire conjunctival sacs from both eyes were excised. In two halves, the excised normal conjunctival sac from each eye of a cadaver was placed on a symblepharon shell and inserted into position. The larger part of the graft sloughed. After two months, the cornea in the left eye ulcerated and exenteration of the eyeball was performed. In the right eye, the conjunctival sac, after the symblepharon shell had been left in place for three months, began to shrink and dry and total symblepharon gradually recurred.

H. D. Lamb.

Goldfeder, A. E., and Viner, K. G. The role of latent malaria in trachoma. *Viestnik Opht.*, 1938, v. 13, pt. 1, p. 87.

The authors urge antimalarial therapy in cases of trachoma with clinical malaria, in cases with a history of malaria, and in cases in which the corneal complications appear out of proportion to the lid involvement and the usual therapy is ineffective.

Ray K. Daily.

Grancini, L. E. Oriel's substance "P" and spring conjunctivitis. *Boll. d'Ocul.*, 1938, v. 17, Jan., pp. 27-39.

Oriel, studying in 1929 the metabolism of proteid substances in patients affected by allergy, isolated from

the urine a substance he indicated with the letter "P." This substance, inoculated in other persons, reproduced the allergic syndrome presented by the patient, but the syndrome was not manifested if the same patient was injected with substance "P" obtained from another patient affected by a different form of allergy. The specific substance appeared in the urine only during the allergic attack. In tabulated form the writer gives the results obtained by treating with such specific substances fourteen patients affected by spring conjunctivitis. He concludes that this type of conjunctivitis is an anaphylactic disorder. The results were satisfactory as to subjective but negative as to objective symptoms. (Bibliography.)

Melchior Lombardo.

Hurst, V. R. Conjunctival granuloma with adenopathy. *Texas State Jour. Med.*, 1938, v. 33, March, p. 760.

Hurst saw nineteen patients with oculoglandular syndromes. Sections of tissue were sent to six ophthalmologists, who disagreed as to diagnosis of the basic pathology. A case in a 17-year-old boy is reported.

Theodore M. Shapira.

Julianelle, L. A., Harrison, R. W., and Lange, A. C. Studies on inclusion blennorrhea. 2. Expressional transmission. *Amer. Jour. Ophth.*, 1938, v. 21, Oct., pp. 1137-1147.

Julianelle, L. A., Harrison, R. W., and Lange, A. C. Studies on inclusion blennorrhea. 3. Experimental considerations of the etiology. *Amer. Jour. Ophth.*, 1938, v. 21, Nov., pp. 1230-1241.

Massoud, Farid. The constitutional side in the pathology and treatment of

trachoma. Bull. Ophth. Soc. Egypt, 1936, v. 29, p. 123.

The fact that in many cases there is apparently an individual immunity as well as a group immunity to trachoma, coupled with the fact that experimental trachoma differs radically from trachoma occurring naturally, leads the author to the conclusion that constitutional treatment for trachoma is beneficial. He stresses the value of balanced diet and healthful living conditions, and had no recurrences of trachoma in his patients when proper general care was available. Edna M. Reynolds.

Mazzai, Dirceu. Ocular pemphigus. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 1, pp. 266-271.

After a brief review of the literature, the author reports one case in a patient 21 years of age. Both eyes were affected, and both eyelids were adherent to the globe, forming total symblepharon. The conjunctival fornix had disappeared, and the palpebral fissure was considerably reduced in size. Only the lower third of the cornea, densely opaque, was free from adhesion.

Ramon Castroviejo.

Montes, G. G., and Silva, A. Erythema nodosa and phlyctenular keratoconjunctivitis in a tuberculous child. *Rev. Cubana Oto-Neuro-Oft.*, 1938, v. 7, March-April, p. 46.

A case of erythema nodosa and phlyctenular disease occurring in a two-year-old child with a positive tuberculin test and radiographic evidence of active pulmonary tuberculosis is reported.

Edward P. Burch.

Muldoon, W., and Kahn, I. S. Local allergy of the eye due to orris root. *Texas State Jour. Med.*, 1938, v. 33, April, p. 822.

An allergic condition of the eye of four years standing, in a woman of 25 years, was cured in three weeks by desensitization.

Theodore M. Shapira.

Pascheff, C. The origin of folliculoma and follicles in Denig's transplant. *Klin. M. f. Augenh.*, 1938, v. 101, Sept., p. 361.

Pascheff's earlier researches showed that trachoma was not an exudative but a hyperplastic process, with confluence of follicles. This he termed folliculoma in place of the usual designation of granulations or granuloma for the conjunctiva and pannus crassus or sarcomatosus for the cornea. A new observation of an incipient confluent pannus follicularis or folliculoma of the cornea, with evolution of follicles to folliculoma, is reported, and also a relapse of follicles in transplanted oral mucous membrane after excision. The follicles always originate around the blood vessels, and the folliculoma is the final product of this development.

C. Zimmermann.

Poleff, L. Seroreaction of Weil-Félix in trachoma. *Klin. M. f. Augenh.*, 1938, v. 101, Aug., p. 243.

According to most authors the rickettsias make up the trachoma inclusions (Prowazek and Halberstädter) which were formerly interpreted as elementary corpuscles. By cultivation of trachomatous tissue Poleff confirms the belief that these formations are living organisms. The positive Weil-Félix reaction obtained by the author in trachoma speaks for the rickettsia nature of the pathogenic agent of that disease.

C. Zimmermann.

Pöstić, Svetozar. The significance of the serologic reaction of Weil-Félix in

trachoma, a contribution to the rickettsia etiology of trachoma. *Klin. M. f. Augenh.*, 1938, v. 101, Sept., p. 341.

In this discourse on 120 cases of trachoma the author concludes that the high percentage of positive Weil-Félix serologic reactions shows that this reaction has an indisputable importance and speaks for the etiologic role of rickettsias in trachoma.

C. Zimmermann.

Rifai, M. O. Histopathology of trachoma of conjunctiva. *Bull. Ophth. Soc. Egypt*, 1936, v. 29, p. 5.

The observations presented were made at Qualawoon Ophthalmic Laboratory. The proliferative and regressive changes of trachoma are briefly described. Edna M. Reynolds.

Schwarz, Edith. Relations between duration of sunshine and frequency of scrofulous keratoconjunctivitis. *Klin. M. f. Augenh.*, 1938, v. 101, Oct., p. 585.

The frequency of keratoconjunctivitis rises with lack of sun radiation.

C. Zimmermann.

Steigelmann, L. G. Steam douche for treatment of ophthalmoblennorrhea (gonoblennorrhea). *Klin. M. f. Augenh.*, 1938, v. 101, Oct., p. 572.

As the full effect of milk injections or gonococcus vaccine does not occur within three or four days, during which interval the cornea is exposed to destruction, local treatment for rapid removal of the gonococci is imperative. This is facilitated by the sensitiveness of gonococci to heat, as administered in a steam douche at a distance of ten or fifteen cm. C. Zimmermann.

Sverdlick, Jose. Jacobson's solution in the treatment of trachoma and cor-

neal opacities. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, Jan., p. 33.

The author advocates the use of Jacobson's solution, benzyl cinnamate, in the therapy of trachoma and corneal opacities, especially in eyes exhibiting marked vascularization. Its use in eight cases is reported. Edward P. Burch.

Thygeson, Phillips. Treatment of staphylococcic conjunctivitis with staphylococcus toxoid. *Arch. of Ophth.*, 1938, v. 20, Aug., pp. 271-273.

Immunization with staphylococcus toxoid was carried out in a series of 57 patients in whom the conjunctivitis was of long standing and had resisted local treatment for not less than two months. Twenty-one patients showed healing, nineteen showed clinical improvement, and seventeen no improvement. Eight of the 21 in whom healing had occurred had a recurrence which disappeared after a second course of toxoid therapy.

J. Hewitt Judd.

Thygeson, Phillips. Mannitol fermentation as an indicator of conjunctival pathogenicity of staphylococci. *Arch. of Ophth.*, 1938, v. 20, Aug., pp. 274-275.

The manitol fermentation test as performed on phenol red-mannitol agar plates is a reliable indicator of the probable conjunctival pathogenicity of staphylococci. J. Hewitt Judd.

Tichvinskii, B. T. The use of egg membrane in plastic operations on the eyeball. *Viestnik Opht.*, 1938, v. 13, pt. 3, p. 397. (See Section 16, Injuries.)

Trapezontzeva, E. E. Rickettsia in trachoma. *Viestnik Opht.*, 1938, v. 13, pt. 3, p. 378.

As a result of her investigations Trapezontzeva concludes that ricket-

tsia, found in the intestines of lice infected with trachoma, are not the causative agent of trachoma. The presence of rickettsia is incidental and can be avoided by careful laboratory technique, and they are to be regarded as non-pathogenic parasites of lice.

Ray K. Daily.

Wilson, R. P. The pathology of trachoma. *Bull. Ophth. Soc. Egypt*, 1936, v. 29, p. 1.

In Egypt, trachoma usually commences with an attack of acute ophthalmia. The very first changes are those of subacute inflammation in the palpebral conjunctiva, and smears at this stage commonly show intracellular inclusion bodies. In the early stages of trachoma-follicle formation, there is no feature or characteristic cell whereby it may be distinguished from a follicle of simple origin. Egyptian trachoma is characterized by a marked tendency to spontaneous cicatrization. The pathology of trachoma is simply the pathology of chronic inflammation.

The author is definitely not of the opinion that the trachomatous changes in the limbus and cornea are due to extension by way of the fornix and bulbar conjunctiva, but thinks that the corneal changes occur as the direct result of infection by contact with the lid.

Edna M. Reynolds.

6

CORNEA AND SCLERA

Anneberg, A. R. Corneal reaction to weed pollen. *Amer. Jour. Ophth.*, 1938, v. 21, Nov., pp. 1265-1266.

Aranson, G. L. Mooren's ulcer of the cornea. *Viestnik Opht.*, 1938, v. 13, pt. 3, p. 407.

A report of a case.

Busacca, A. *Leishmania keratitis*. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 1, pp. 261-262.

Cornea, conjunctiva, and eyelids of both eyes were affected. Microscopic study of biopsy material from both eyes revealed granulation tissue with giant cells. Differential diagnosis in these cases is to be made from tuberculous and trachomatous conditions.

Ramon Castroviejo.

Cassuto, Nathan. *Bilateral disciform keratitis*. *Boll. d'Ocul.*, 1938, v. 17, Jan., pp. 14-26.

A woman of 36 years had a number of attacks of pneumonia. Soon after a recent attack she had been affected by discoid infiltration of both corneae in their external paracentral zones, 3 mm. in diameter, and with punctate deposits on Descemet's. The infiltration was formed of several concentric rings of different density. Corneal sensibility was diminished. The writer regards the corneal lesions as herpetic. (Bibliography, 2 figures.)

Melchior Lombardo.

Charamis, J. S. The syndrome of blue sclerotics (Van der Hoeve's syndrome). *Ann. d'Ocul.*, 1938, v. 175, Oct., pp. 738-746.

Four generations of one family with the syndrome of blue sclerotics were studied. This is the first study of this disease in Greece. Other ocular findings beside blue sclerotics were: arcus senilis, keratoconus, and paucity of conjunctival vessels. Otosclerosis, multiple fractures, and still-births were also found in this family. A diagram of the four generations and of the mode of inheritance is shown.

John M. McLean.

Dudinov, O. A. Staining the cornea with gold chloride. *Viestnik Opht.*, 1938, v. 13, pt. 2, p. 246.

The author points out that 0.33-percent-solution of gold chloride is as effective as stronger solutions, and is free from the post-operative complications caused by them. (Illustrations.)

Ray K. Daily.

Filatov, V. P. Therapeutic transplantation of homoplastic conjunctiva preserved on ice. *Viestnik Opht.*, 1938, v. 12, pt. 3, p. 307.

A report of cases. Filatov holds that the transplanted cornea is absorbed and therefore not suitable for plastic purposes, but that the transplantation has a favorable effect on the tissue of the host and therefore has therapeutic indications.

Ray K. Daily.

Goldbach, L. J. Kayser-Fleischer ring—Wilson's disease. *Amer. Jour. Ophth.*, 1938, v. 21, Oct., pp. 1118-1128.

Hobson, L. C. Acute epidemic superficial punctate keratitis. *Amer. Jour. Ophth.*, 1938, v. 21, Oct., pp. 1153-1155.

Juhász-Schäffer, A. A case of avascular parenchymatous keratitis of one eye based on congenital lues. *Klin. M. f. Augenh.*, 1938, v. 101, Oct., p. 576.

The mother of a woman aged 32 years had been treated for a long time for lues after the birth of the patient. At the age of nineteen years the patient had had intense pain in the tibia for which she had been treated with mercury and iodine. She had a healthy daughter of four years. In the fifth month of a new pregnancy the sight of the right eye failed from parenchymatous keratitis, without the least development of blood vessels. The attack showed a very benign character and after a long course healed with vision

almost normal. The personal experiences of the author indicate that parenchymatous keratitis becomes more benign with increasing age.

C. Zimmermann.

Khavina, A. O. Intravenous administration of magnesium sulphate in the treatment of corneal ulcers. *Viestnik Opht.*, 1938, v. 13, pt. 2, p. 254.

The author finds the dehydrating influence of intravenous injections of magnesium sulphate very effective in the treatment of corneal ulcers.

Ray K. Daily.

Kleefeld, G. Treatment of herpetic affections of the cornea and of dendritic ulcer by sulfanilamide derivatives. *Bull. Soc. Belge d'Opht.*, 1938, no. 76, p. 14.

Kleefeld reports results obtained by treatment with sulfanilamide derivatives, astreptine (Meurice) and white prontosil (Bayer) in twenty cases of herpes of the cornea and five cases of dendritic ulcer. A brief history of each case is included. The treatment was in general limited to ingestion of the medicine without local treatment. In the majority of cases a cure resulted, but relapses were observed even during treatment. No serious incidents occurred. The writer concludes that sulfanilamide derivatives act upon diseases due to a virus. Also that they can cure corneal herpes, superficial punctate keratitis, and dendritic keratitis. However, the limited number of cases does not warrant the conclusion that cures will be permanent, and some cases, especially chronic ones, are not affected by the treatment. Only future research can safely indicate what preparation of sulfanilamide should be chosen, as well as the dose and the duration of treatment.

J. B. Thomas.

Moretti, Egisto. Contribution to the surgery of trachomatous corneal pannus. (Perirrhaphy.) *Klin. M. f. Augenh.*, 1938, v. 101, Sept., p. 373.

Moretti rejects the traumatic genesis of pannus by friction with the trachomatous tarsal conjunctiva; and he discusses the drawbacks of peridectomy, often leading to symblepharon. In 1929 he devised the limborrhaphy, which in every case improved sight with complete resorption of pannus. Observation of a large number of patients with good results has convinced him that interruption of the vascular net of the pannus is not absolutely necessary for success, which is rather to be attributed to the hyperemia produced by the remaining catgut thread. Hence he has abandoned peridectomy, and uses a technique which exerts stronger irritation of longer duration. He calls the method perirrhaphy. Three mm. from the cornea a thread of black silk is carried along the whole periphery of the cornea, reinserting the needle from point to point to form an episcleral ring. The ends of the thread are left long and are carried out at the lateral angle. This creates an intense but harmless hyperemia, capable of increasing the phagocytic elements in the cornea, leading to absorption of the pannus newformation and healing of corneal ulcers. The thread may remain from 20 to 30 days. C. Zimmermann.

Motolese, Alfonso. Epithelial and endothelial dystrophies of the cornea. *Boll. d'Ocul.*, 1938, v. 17, Jan., pp. 1-13.

In a man of 34 years, slowly progressive bilateral endothelial dystrophy of the cornea was followed by epithelial dystrophy. The patient, whose father was luetic, was the only one of five children who was affected by eye disease.

One had died of tuberculosis, and the patient was affected by tuberculosis of the lungs. Two sisters, 14 and 24 years of age respectively, each showed a congenital affection of the cornea, with typical signs of Fuchs's epithelial dystrophy of the cornea. (1 figure.)

Melchior Lombardo.

Oradovskaja, E. I. Campimetric focal reactions in the diagnosis of tuberculous choroiditis. *Viestnik Ophth.*, 1938, v. 13, pt. 2, p. 199.

On the basis of 29 clinical cases the author concludes that the reaction of choroidal foci to subcutaneous introduction of minimal doses of tuberculin is always an enlargement of the blind spot. This enlargement appears 24 hours after the injection, may last and increase for 48 hours, and then gradually recedes. The extent of the enlargement depends on the dose of tuberculin and on the sensitivity and character of the choroiditic focus. The enlargement of the blind spot can be demonstrated in cases in which ophthalmoscopic changes cannot be detected and is the result of edema of the optic nerve and adjacent retina. This enlargement is always absent in healthy eyes. The reaction is a very valuable diagnostic sign, more sensitive than the ophthalmoscopic or tonometric findings.

Ray K. Daily.

Pantasatos, Georg. Intrasccleral ciliary nerve loops in the posterior segment of the eyeball. *Zeit. f. Augenh.*, 1938, v. 95, Sept., p. 305.

Sections from three globes are described in which intrasccleral loops of ciliary nerves were observed. The observations do not elucidate the morphogenesis or significance of the phenomenon. F. Herbert Haessler.

Pavlova, A. D. Osmotherapy in acute trachomatous pannus. *Viestnik Opht.*, 1938, v. 13, pt. 2, p. 256.

The author obtained very satisfactory results in pannus from intravenous injection of 10-percent sodium chloride.

Ray K. Daily.

Povolotzkaia-Burstein, M. B. A rare case of corneal degeneration. *Viestnik Opht.*, 1938, v. 13, pt. 2, p. 258.

A report of a case of slow degenerative corneal process in the left eye, leading to visual deterioration. Five years after initiation of the process in the left eye, a peripheral corneal opacification with adjacent conjunctival vascularization but without inflammatory phenomena appeared in the right eye. The search for etiology was fruitless, and anemia was the only systemic deviation from normal found after exhaustive general examination. Ray K. Daily.

Rubbrecht, M. The surgical treatment of corneal affections. *Arch. d'Opht. etc.*, 1938, v. 2, Aug., p. 714. (See *Amer. Jour. Ophth.*, 1938, v. 21, July, p. 806.)

Sagher, Erwin. Non-familial juvenile dystrophy of the cornea. *Klin. M. f. Augenh.*, 1938, v. 101, Oct., p. 507.

A girl of thirteen years, youngest of four children in a family that gave no history of eye disease, had shown an opacity of the cornea at the age of two years. There were no signs of dysostosis multiplex, but paresis of both abducens muscles. The cornea presented changes in the anterior strata of the parenchyma, without involvement of the epithelium or Descemet's membrane. Blue-light radiation and massage with dionin salve were unsuccessful. The patient also showed choreic twitching. The case is explained by disturb-

ance of development on a degenerative basis.

C. Zimmermann.

Saveliev, S. V. Subconjunctival implantations of various tissues in trachomatous pannus. *Viestnik Opht.*, 1938, v. 13, pt. 2, p. 252.

The author adds homologous sclera to the list of substances used for implantation in pannus.

Ray K. Daily.

Soliman, M. A. Fatty degeneration in trachomatous cornea. *Bull. Ophth. Soc. Egypt*, 1936, v. 29, p. 151.

Discs of tissue were removed with a trephine from the superficial and middle layers of the cornea, for pathologic examination. Bowman's membrane was found to be completely destroyed and the substantia propria replaced by fibrous tissue, which was infiltrated with fat and cholesterin. The deeper layers of the cornea were involved as well as the superficial. (7 illustrations.)

Edna M. Reynolds.

Sukhov, S. V. Results of Denig's operation in trachomatous pannus. *Viestnik Opht.*, 1938, v. 13, pt. 1, p. 64.

A tabulated report of twenty operations. The results show that the operation has a favorable effect on the course of pannus, but that the effect is not permanent and the transplant is not immune to infection with trachoma, even when the operation is performed in the cicatricial stage of the disease.

Ray K. Daily.

Sverdlick, Jose. Jacobson's solution in the treatment of trachoma and corneal opacities. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, Jan., p. 33. (See Section 5, Conjunctiva.)

Velhagen, Carl, Jr. Concerning the problem of double gerontoxon. *Trabal-*

hos do Primeiro Cong. Brasileiro de Opth., 1936, v. 1, pp. 263-264.

The author reports double gerontoxon in both eyes of a patient 17 years of age. He had previously reported a similar case. The pathogenesis is briefly discussed. (Bibliography.)

Ramon Castroviejo.

Velter, C. L. Clearing of opacities following corneal transplantation. *Viestnik Opht.*, 1938, v. 13, pt. 1, p. 44.

The author reports a series of cases to show that transplantation of cadaver cornea has a more favorable effect on corneal scars than transplantation of living cornea. Cadaver cornea transplantation is therapeutically effective even in very old scars.

Ray K. Daily.

Zur Nedden. An epidemic of superficial punctate keratitis. *Klin. M. f. Augenh.*, 1938, v. 101, Oct., p. 567.

The affection consisted of numerous punctate infiltrations and diffuse opacities in the outer layers of the cornea closely below Bowman's membrane. It commenced with, or was followed by, catarrhal symptoms of the conjunctiva, and showed a familial spreading which indicated its infectious nature. In 23 cases the conjunctiva, and in 35 cases the cornea, had previously been injured by a foreign body. Apart from diplobacilli the smear showed no pathogenic bacteria. At first all cases were treated with two-percent nitrate of silver, then with a colloidal silver salve.

C. Zimmermann.

7

UVEAL TRACT, SYMPATHETIC DISEASE AND AQUEOUS HUMOR

Bakker, A. Some noteworthy movements of the pupil. *Graefe's Arch.*, 1938, v. 139, pt. 2, pp. 273-279.

It was found by experiments with rabbit's iris, transplanted to a culture fluid, that fresh amounts of acetylcholin were produced for several days. The concentration of acetylcholin may be so great that the pupillary contraction caused by its strong irritation of the oculomotor fibers is not overcome by atropine. Contraction of the pupil with paracentesis when previously dilated by atropine is explained by the strong irritation of the oculomotor fibers due to change in intraocular tension.

H. D. Lamb.

Baquis, Mario. Ocular complications of intestinal amebiasis. *Rassegna Ital. d'Ottal.*, 1938, v. 7, May-June, pp. 338-350.

In about 50 percent of the cases of intestinal amebiasis there are ocular complications, and in the majority of these the anterior uveal tract is involved. Of 108 cases in the literature only three showed involvement of the choroid. Baquis adds another case to this list—a soldier of 31 years with amebic enterocolitis. The patient developed bilateral choroiditis, more marked in the left eye. Three hypotheses as to the relation between the ocular pathology and the intestinal disease are presented: (a) direct invasion of the blood stream by amebae, (b) bacterial invasion through intestinal ulceration, and (c) toxins from the amebae. The author inclines to the last view. All other causes of choroiditis were carefully excluded by a two-year study of the patients.

Eugene M. Blake.

El Bakly, M. A. A peculiar case of polycoria. *Bull. Ophth. Soc. Egypt*, 1936, v. 29, p. 153.

Supernumerary pupils exactly in the horizontal meridian and in the outer half of each iris are described. The

openings were lined with iris pigment and reacted to light simultaneously with the pupil. In the right eye a ridge of iris tissue was adherent to the cornea near the limbus.

The literature on congenital anomalies of this sort is briefly reviewed, as well as the embryology of the anterior chamber. Edna M. Reynolds.

Farina, Ferdinando. Tuberculosis, syphilis, and chronic anterior uveitis. *Rassegna Ital. d'Ottal.*, 1938, v. 7, May-June, pp. 301-327.

Farina studied forty cases of chronic anterior uveitis with the greatest minuteness, including microscopic examination of the aqueous. He relates four cases in detail, as typical of the group, and concludes that if one excludes the cases that are obviously associated with definite etiology, such as focal infection or recurrent fever, and also those associated with active syphilis or tuberculosis, one will find a latent luetic or tuberculous basis for the remainder. In the cases commonly ascribed to rheumatism, endocrine disturbance, or intestinal stasis, and so often resistant to treatment and subject to recurrence, he believes that syphilis and tuberculosis are underlying causes and that treatment should be on this basis. Study of the cells in the aqueous supports this contention as do also the serum reaction and tuberculin tests.

Eugene M. Blake.

Fleischanderl, A. Concerning the clinical course and pathology of spontaneous choroiditis. *Wiener klin. Woch.*, 1938, v. 51, Oct. 7, pp. 1096-1099.

A male patient aged 27 years had noted diminished right vision during the two weeks prior to his first examination. Examination revealed the

picture of occlusion of the central vein and masses of exudate over the upper half of the optic disc. In the left eye, whose vision was normal, there was an apparently old disseminated chorioretinitis. During the following three months, increase of right intraocular tension necessitated several operations, but the eye remained hard, and right vision was completely lost, although the inflammatory symptoms gradually subsided and the eye became pale. Tuberculin therapy. Three years afterward renewed attacks of pain necessitated enucleation of the right eye.

Histologic examination of the globe revealed, in addition to the residua of the first exudative inflammatory attack around the optic nerve, an extensive infiltration of the choroid with nodules composed mainly of epithelioid cells, that is, the typical picture of a chronic infiltrative process. The author's findings confirm Meller's statement that infiltration with epithelioid cells is the outstanding feature in the histologic picture of this disease. This case also illustrates well the fact that spontaneous choroiditis may manifest itself under different clinical and pathologic pictures, even in the same eye, combining not infrequently acute exudative and chronic infiltrative processes. Although search for tubercle bacilli was negative in this particular eye the author feels no doubt about the tuberculous nature of the affection. Bertha A. Klien.

Gallino, J. A. Free cyst in the anterior chamber. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 1, pp. 305-310.

A young man 19 years of age showed a small oval cyst about 1 by 2 mm., lying in the iridocorneal angle at the 6-o'clock position. The thin membranous wall of the cyst showed pigment

deposits of the color of the iris. The cyst was free and moved in different directions with movements of the patient's head. The rest of the eye, as well as the vision, was found normal. The pathogenesis is briefly discussed. The author is inclined to believe that the cyst originated in proliferation of epithelial cells on the surface of the iris or ciliary body, these cells undergoing cystic degeneration and becoming detached by some slight trauma.

Ramon Castroviejo.

Grolman, G. von. Recent observations on central serous chorioretinitis. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, May, p. 235.

The author's attention was first drawn to this condition by the work of Asayama, who described a type of central serous chorioretinitis characterized clinically by a grayish-white edema confined to the macular region. The edema is sharply localized and is due to a serous exudate between the choroid and retina. Occasionally tiny hemorrhages are found. Subjectively there is a diminution of visual acuity, with a central scotoma corresponding exactly to the area of retinal disturbance. Micropsia and disturbances of light and color sense may be present. The condition lasts from one to eight weeks and the prognosis is favorable in the majority of cases. Tuberculous etiology can be demonstrated in most cases. This type of chorioretinitis may be confused with retrobulbar neuritis, and the diagnosis is greatly facilitated if the fundus is examined with the binocular ophthalmoscope. Three cases are reported in detail. (Illustrated.)

Edward P. Burch.

Guillaumat, L. Ocular complications of the icterohemorrhagic spirochete.

Arch. d'Ophth. etc., 1938, v. 2, Sept., p. 785.

The case of a young man whose left eye presented an iridocyclitis with optic neuritis consecutive to an infectious relapsing jaundice is reported. The blood test for the spirochete of Inada-Ido was positive. Five months after onset, and after repeated attacks, the eye quieted and the vision improved. Rubiazol by mouth was credited with the cure. The spirochete and the pathogenesis of the disease are described, and a discussion of the literature follows. (Bibliography.) Derrick Vail.

Gutzeit, R. Remarks on the article "Color of eye" by H. Stockmann. *Klin. M. f. Augenh.*, 1938, v. 101, Oct., p. 565.

Stockmann's assertion that the number of individuals with brown eyes above the 55th year of life solely depends on the progressive discoloration of the iris in senescence (see *Amer. Jour. Ophth.*, 1938, v. 21, p. 1054) is not correct. The color proportion depends (apart from senile discoloration of the iris) essentially upon the population in which the number of brown-eyed is ascertained.

C. Zimmermann.

Kronfeld, P. C., and Lin, C. K. Further studies on the regeneration of the aqueous in man. *Amer. Acad. Ophth. and Otolaryng.*, 1937, 42nd mtg., p. 262.

The authors performed more than 200 anterior-chamber punctures for diagnosis and treatment. They conclude that the intraocular tension of the human eye immediately after paracentesis depends upon the relation between the volume of the anterior chamber and the volume of the entire globe. The time necessary for restoration of intraocular

pressure to the original level depends on the original volume of the anterior chamber, while the rate at which new intraocular fluid is formed appears to be independent of the original chamber volume. Complete emptying of the chamber is a stronger stimulus than partial emptying as far as the reactive changes such as hypertension are concerned. (Bibliography, discussion, 4 tables.) George H. Stine.

Mieses-Reif, Maria. The pigment content of the hair and the iris. *Klinika Oczna*, 1938, v. 16, pt. 4, p. 460. (See *Amer. Jour. Ophth.*, 1937, v. 20, June, p. 657.)

Pautrier, L. M. The ocular lesions of Besnier-Boeck-Schaumann disease. *Arch. d'Ophth. etc.*, 1938, v. 2, Aug., p. 689.

A biopsy from the skin lesions of a case of Heerfordt's syndrome (parotiditis, facial paralysis, iridocyclitis with visual disturbance) showed the characteristic structure of Besnier-Boeck-Schaumann disease (sarcoid or benign lymphogranulomatosis). Animal-inoculation experiments showed no tuberculosis, and for that reason the author believes that a virus not as yet isolated is responsible. Evidence is presented that Heerfordt's syndrome is but a part of the picture of Boeck's disease. Derrick Vail.

Uebe, Vera. Malformations of the iris. *Klin. M. f. Augenh.*, 1938, v. 101, Oct., p. 586.

Included are: two cases of aniridia with opacities of the lens, nystagmus, and glaucoma; a case of superficial iris coloboma and connections of the iris with the posterior surface of the cornea (mesodermal dysgenesis); a case of

ectopia of the pupil on both sides, with gaps in one iris; a case of extensive connections between the anterior layer of iris and the cornea, the iris being split into two layers; a case of embryotoxon corneae posterius, with filamentous adhesions to the iris, and glaucoma; two cases showing extensive remnants of pupillary membrane, exudations in the vitreous, and lens opacities; and two cases showing nodular protrusions of iris stroma, explained as intraepithelial iris cysts.

C. Zimmermann.

Viallefont and Lafon. Entopic pupillometry: spontaneous variations of pupillary diameter. *Arch. d'Ophth. etc.*, 1938, v. 2, Nov., p. 991.

A light source placed behind and to the side of the observer is reflected into the pupil by a brightly polished convex surface (metal button) held 1 cm. from the side of the eye. A luminous circle is thus projected against the Bjerrum screen one meter away. By this means spontaneous variations in pupillary diameter were studied. Movements of dilatation are slow and are apt to be unperceived. Movements of contraction are rapid. No regular rhythm was found, and the movements are independent of blood circulation, respiration, or psychic phenomena. (Diagram.) Derrick Vail.

Weekers, L., and Reginster, H. A new syndrome; iritis, acute ulcers of the mouth and vulva. Its relationship to relapsing hypopyon iritis. *Arch. d'Ophth. etc.*, 1938, v. 2, Aug., p. 697.

The dermatologists have recently drawn attention to a relapsing syndrome peculiar to the female, consisting of thrush of the mouth, acute ulcers of the vulva, and iritis. Relapsing hypopyon iritis in the male has been known

for some time. The authors believe that the disease is the same in both sexes, and propose that it be named "allergic relapsing hypopyon uveitis." Sulphanilamide treatment yielded a very favorable result in one of the cases reported. Blood transfusions are also advised. (Bibliography.) Derrick Vail.

8

GLAUCOMA AND OCULAR TENSION

Archangelskii, P. F. *Biomicroscopy of the cicatrix following Elliot's operation.* *Viestnik Opht.*, 1938, v. 13, pt. 1, p. 21.

The arrangement of blood vessels around 24 postoperative cicatrices was studied. The author finds that the blood-vessel arrangement is very similar to that enclosing a foreign body or surrounding a corneal infiltrate. He attributes the reduction in tension following successful operation to increased drainage through the blood vessels surrounding the cicatrix. Ray K. Daily.

Cornet, Emmanuel. *Cyclodialysis sclerectomies.* *Ann. d'Ocul.*, 1938, v. 175, Sept., pp. 678-686.

The author combines Lagrange's sclerectomy and Heine's cyclodialysis. There are two types of operation, the anterior or limbal, and the posterior or retrociliary. In the first, a Lagrange sclerectomy with peripheral iridectomy is accompanied by cyclodialysis from the limbus posteriorly. In the second, a Heine cyclodialysis is accompanied by posterior sclerectomy at the site of the usual cyclodialysis incision. Seven rabbits were operated on by the new techniques. Four survived operation and had slightly subnormal intraocular pressure for weeks afterward.

John M. McLean.

Friemann. The action of veritol on the human eye. *Klin. M. f. Augenh.*, 1938, v. 101, Oct., p. 583.

Veritol, a preparation similar to adrenalin, was entirely satisfactory in glaucoma for lowering intraocular tension, especially when the usual drugs did not bring the tension to normal.

C. Zimmermann.

Gilde, Irmgard. Investigations on the action of pilocarpine, homatropine, and coffee on the intraocular tension of the normal eye as basis for diagnosis of latent glaucoma. *Klin. M. f. Augenh.*, 1938, v. 101, Oct., p. 586.

Homatropine and coffee produced a slight increase, pilocarpine in a third of the cases a decrease after moderate initial increase. In these experiments the normal eye showed fluctuations of pressure as in glaucoma.

C. Zimmermann.

Kovarskaja, S. S., and Krol, A. G. Disseminated subcapsular glaucomatous cataract. *Viestnik Opht.*, 1938, v. 13, pt. 2, p. 262. (See Section 9, Crystalline lens.)

Mikhailova, E. V. The median blood pressure in glaucoma. *Viestnik Opht.*, 1938, v. 13, pt. 1, p. 78.

The median blood pressure of 34 glaucoma patients was determined with the oscillometer. The findings show increased pressure in 75 percent of the cases. Increased median pressure without a rise in systolic pressure was found in 37.5 percent, and a rise in both pressures in 37.5 percent.

Ray K. Daily.

Ratinova, K. A. Comparative evaluation of the effect of pilocarpine and eserine on the scotoma of the glaucomatous eye. *Viestnik Opht.*, 1938, v. 13, pt. 2, p. 237.

Samoilov proposed the pilocarpine diagnostic test to differentiate glaucomatous scotomata from scotomata of other etiology. He maintained that in glaucoma pilocarpine causes a shrinking of the blind spot, while in other diseases the instillation of pilocarpine has no effect on the size of the blind spot. The author's present investigations were concerned with determining the relative value of pilocarpine and eserine in this test. The results show that both eserine and pilocarpine produce a temporary shrinking of the blind spot. Two percent pilocarpine produces greater contraction than 0.25 percent eserine and is therefore preferable for the test. The duration of contraction of the blind spot may be used to determine the frequency of miotic instillation necessary in the treatment of glaucoma.

Ray K. Daily.

Robertson, J. D. Intraocular pressure in nephrotic edema. *Lancet*, 1938, v. 234, June 25, pp. 1435-1436.

The intraocular pressure was measured in a series of cases of marked nephrotic edema and found to be within normal limits. As the plasma proteins rose the edema subsided, but no change took place in the level of the intraocular pressure. The eye, therefore, does not share in the water-logging common to other tissues of the body, and is unaffected by failure of the factors which govern the normal interchange of fluids throughout the body. These observations suggest that the aqueous humor can no longer be regarded as a dialysate.

T. E. Sanders.

Rokitzkaia, L. V. Clinical studies of the ocular reaction on the fellow eye. *Viestnik Ophth.*, 1938, v. 13, pt. 3, p. 337.

A review of the literature and a study

of 40 operative cases of primary glaucoma, 19 cataract cases, and 13 enucleations. The conclusions are that changes in the ocular tension of the non-operated eye confirm the interrelation of the processes in the two eyes. These changes are most pronounced in glaucoma. They are transitory, and no definitely permanent changes could be demonstrated. No relation could be demonstrated in the degree of reaction to the type of pathologic process or the effectiveness of the operative procedure. The appearance of variations in the ocular tension of the fellow eye prior to the operation suggests a psychogenic origin rather than a pain reflex. An effect on the ophthalmotonus of the good eye was found also after akinesia; which shows that action on the eyeball itself is not essential for this reaction. The latter is probably the expression of a series of complicated processes acting on the patient. The absence of any regularity in these changes is probably due to individual variations in the nervous system.

Ray K. Daily.

Satanowsky. Paulina. Treatment of absolute and painful glaucoma by X rays. *Arch. de Oft de Buenos Aires*, 1938, v. 13, May, p. 227.

In painful, blind, glaucomatous eyes the use of X rays for relief of pain is advocated. It is claimed that the majority of eyes so treated are rendered free from pain even though the intraocular tension remains elevated. Glaucoma following central venous thrombosis is stated to be favorable for X ray treatment. Three cases treated successfully according to the technique of Basile are reported and a brief summary of the literature on the subject is given.

Edward P. Burch.

Weinstock, M. M. Comparative evaluation of total and peripheral iri-

dectomy in Elliot's trephine operation. *Viestnik Ophth.*, 1938, v. 13, pt. 2, p. 231.

A study of 395 clinical histories leads the author to conclude that relative to tension and visual acuity immediate results are better after operations with total iridectomy, but that late results are better in cases with peripheral iridectomy. There was no difference in the effect of the two types of iridectomy on the visual fields. Ray K. Daily.

9

CRYSTALLINE LENS

Davis, F. A. Capsule forceps for intracapsular cataract extraction. *Amer. Acad. Ophth., and Otolaryng.*, 1937, 42nd mtg., p. 489.

The advantages claimed for these forceps are a smooth biting surface and capability of grasping a large area on the anterior capsule with minimum danger of laceration. (Illustration.)

George H. Stine.

Friede, Reinhard. A modification of the suction apparatus for cataract extraction, and its application. *Klin. M. f. Augenh.*, 1938, v. 101, Oct., p. 573.

A detailed description.

Hurtault, J. B., and Sverdllick, J. Surgical treatment following the reopening of cataract incisions. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, May, p. 251.

Following cataract extraction a sudden severe pain in the eye may indicate reopening of the wound, with prolapse of iris and vitreous. The authors advocate immediate excision of the prolapsed tissue and covering of the upper three fourths of the cornea with a sliding conjunctival flap secured by episcleral sutures. They report a case in which such a complication was treated by this method. Edward P. Burch.

Kovarskaja, S. S., and Krol, A. G. Disseminated subcapsular glaucomatous cataract. *Viestnik Ophth.*, 1938, v. 13, pt. 2, p. 262.

Five cases are reported. Seven eyes had lenticular opacities, characterized by sharply delineated grayish-white opaque foci of varying size and irregular contour, situated immediately under the capsule in its entire visible extent. Such opacities were described by Vogt in 1923 under the name of *cataracta disseminata subcapsularis glaucomatosa*. (Illustrations.) Ray K. Daily.

Marfan, A.-B. Dolichostenomely (dolichomely, arachnodactyly). *Arch. d'Ophth. etc.*, 1938, v. 2, Oct., p. 881.

The author described the first case of this syndrome in 1896. Since then 150 cases have been reported in the literature. It is of particular interest to the ophthalmologist because of the frequency of associated ectopia lentis (50 percent of the reported cases) and other ocular disturbances. The fundamental syndrome includes: elongation and thinning of the bones of the limbs, most marked in the distal extremities; the abnormal height; slenderness and hypotony of muscles; and thinness of the subcutaneous fat. The tendinous contractions are probably only apparent because of the rapid growth of the bones. Dislocation of the lens (which is often small) accompanies rarefaction the zonular fibers, and coloboma of lens, iris, choroid, or lid. The defect is generally bilateral. Of other ocular anomalies which may be present, miosis, amblyopia, and myopia are the most frequent. Less so are enophthalmos, exophthalmos, hydrophthalmos, megalophthalmos, megalocornea, heterochromia iridis, atrophy of the anterior iris surface, persistent pupillary membrane, aniridia, disseminated pigmen-

tion of the choroid, blue sclerotics with fragility of the bones, cataract, nystagmus, and strabismus. Other congenital anomalies are frequently present. The disease is hereditary and familial and its cause is probably an anomaly of development of germinal origin, possibly mesodermal. The theory of hypophyseal dystrophy may probably be ruled out, because in the few autopsies performed the hypophysis has been found to be normal. Treatment is of no avail. (Illustrations, bibliography.)

Derrick Vail.

Strakhow, W. Advantages and disadvantages of intracapsular extraction. *Ann. d'Ocul.*, 1938, v. 175, Sept., pp. 667-678.

Based on his experiences in Moscow and upon the literature, the author lists the following advantages of intracapsular extraction: possibility of earlier operation on immature lenses, relative absence of postoperative iritis (which occurs twice as frequently after extracapsular operation), absence of secondary cataract, better visual acuity. Disadvantages are the necessity for greater manual dexterity and for more perfect instruments. Cases of high myopia and of increased tension are more dangerous by the intracapsular method. Iridectomy is preferred as safer than extraction through a round pupil. Tumbling is not recommended.

John M. McLean.

Van Lint. Extraction of secondary cataract after double incision of the cornea. *Arch. d'Ophth. etc.*, 1938, v. 2, Aug., p. 711.

A new method of extraction of the secondary cataractous membrane is described. Three steps are necessary. (1) Puncture and counter puncture of the limbus are made with the Graefe

knife. The nasal wound is made 5 to 6 mm. long, the temporal one 2 to 3 mm. (2) A cystitome enters the anterior chamber through the small temporal incision, crosses the chamber and is passed behind the nasal iris. Here the blade is turned backward and drawn lightly through the capsule, dragging it toward the center of the pupil. (3) Multiple-toothed capsule forceps are introduced through the large nasal incision and grasp the edge of the capsule, which is then extracted in its entirety by gentle rotary traction. (Illustrations.)

Derrick Vail.

Vogt, Alfred. The cataract discussion at Heidelberg. *Klin. M. f. Augenh.*, 1938, v. 100, Oct., p. 530.

To H. K. Müller's hope of finding a useful remedy for curing senile cataract, Vogt objects that in each of his chemical discussions Müller has confined himself to assumptions, hopes, and debatable hypotheses. From his own observations of single-ovum twins Vogt urges that like other senile signs senile cataract is hereditary, and therefore cannot be influenced by medication. (See also *Amer. Jour. Ophth.*, 1938, v. 21, p. 1172.)

C. Zimmermann.

Vos, T. A. Myotonic-dystrophy cataract. *Ann. d'Ocul.*, 1938, v. 175, Sept., pp. 641-666.

In 39 cases of myotonic-dystrophy cataract, the lens changes were always bilateral but not always equally developed. Some cataracts were of the "Vogt" type, some of the "Fleischer" type, some punctate, and some obscured by senile changes. Genealogic tables of seven families are given and are discussed in some detail. The defect is of the dominant Mendelian hereditary type.

John M. McLean.

Wagner, H., Richner, H., and Karcher, P. Preliminary results of therapy of senile cataract with vitamin B2 (lactoflavin ingestion, controlled by slitlamp microscopy). *Klin. M. f. Augenh.*, 1938, v. 101, Oct., p. 543.

The experiments showed that an improvement or arrest of the senile cataractous process was not caused by vitamin B2. C. Zimmermann.

Zitovskii, M. L. Comments on intracapsular cataract extraction. *Viestnik Opht.*, 1938, v. 13, pt. 1, p. 52.

The author's material consisted of 254 intracapsular extractions. Of these nineteen were with round pupils and the rest had iridectomies. There was vitreous loss in 16 percent of the cases, rupture of the capsule in 6.4 percent, iris prolapse in 2.8 percent, iridocyclitis in 9 cases, expulsive hemorrhage in 2, postoperative glaucoma in 4, choroidal detachment in 3, and purulent infection in 4. Ray K. Daily.

10

RETINA AND VITREOUS

Boström, C. G., and William-Olsson, L. Thrombosis of central vein of retina successfully treated with heparin. *Lancet*, 1938, v. 235, July, p. 79.

A case of thrombosis of the central vein of the retina is reported in which heparin was given intravenously, with clearing of the lesion and improvement of vision. The authors believe that the heparinized blood coagulates less easily and aids in canalization of the thrombus. T. E. Sanders.

Hildreth, H. R. Surgical ophthalmoscope. *Amer. Acad. Ophth. and Otolaryng.*, 1937, 42nd mtg., p. 497. (See *Amer. Jour. Ophth.*, 1937, v. 20, June, p. 626.)

Marmor, J., and Lambert, R. K. Lawrence-Moon-Biedl syndrome. *Arch. Internal Med.*, 1938, v. 61, April, pp. 523-536.

Two classic examples of the Lawrence-Moon-Biedl syndrome, which consists of atypical retinitis pigmentosa, obesity, mental deficiency, genital dystrophy, with polydactylism and of familial occurrence, are reported. The present information points to the fact that pigmentary degeneration of the retina in this condition is a congenital anomaly dependent on an inherited chromosomal factor. This fact suggests that the same may be true of the usual form of retinitis pigmentosa.

T. E. Sanders.

Marshall, J. C. Surgical treatment of detachment of the retina. *Lancet*, 1938, v. 234, May 7, pp. 1033-1037.

In a Hunterian lecture the development of the methods of surgical treatment of retinal detachment is described, including thermocautery, galvanocautery, injection of chemical agents, diathermy surface coagulation, perforating diathermy, electrolysis, and combined diathermy and electrolysis. The last method is described in detail, with indications and contraindications for operating. T. E. Sanders.

Redslob, E. Contribution to the study of the origin of retinal detachment. *Ann. d'Ocul.*, 1938, v. 175, Sept., pp. 637-641.

A globe which was studied histologically shortly after injury showed a very small beginning detachment of the retina. The primary lesion appeared to be a localized dilatation of the veins of the choroid. Immediately over the area was a transudate which had crossed the pigment epithelium and elevated the retina. The transudate had also invaded

the retina, forming cystoid cavities which seemed on the verge of rupturing to form a hole.

Probably several mechanisms are involved in detachment of the retina. Retraction of the vitreous produces negative pressure which allows choroidal vasodilatation to produce a subretinal transudate, with cyst formation in the retinal layers as the precursor of a hole. Either a hole is formed through which vitreous seeps behind the retina, or, in the absence of a hole, choroidal transudate separates the retina.

John M. McLean.

Satanowsky, Paulina. Recurrent vitreous hemorrhages and menstruation. *Arch. de Oft de Buenos Aires*, 1938, v. 13, April, p. 173.

The author discusses the etiology of recurrent vitreous hemorrhage and cites three cases of her own in which the hemorrhages were related to the menstrual cycle. In the first case there was a direct relation between menstruation and the vitreous hemorrhages, which cleared under calcium therapy. None of the usual causes of vitreous hemorrhage were found after careful examination. In the second case the patient had both a positive Wassermann reaction and a positive Mantoux test. The third patient suffered from dysmenorrhea and hypertension.

The author concludes "that the changes produced in the circulatory system of women before and during menstruation are sufficient in themselves to produce vitreous hemorrhages, and that their influence is always manifest even in those cases in which the primary cause of the local vascular lesion is different."

Edward P. Burch.

Veil, P., and Guillaumat, L. Retinal cysts. *Arch. d'Opht. etc.*, 1938, v. 2, Nov., p. 977.

Retinal cysts develop within the layers of this membrane and form lacunar cavities filled with a fluid rich in albumin, but poor in cells. Thus they are differentiated from parasitic cysts, and are closely allied to retinal detachment. They are particularly prone to develop tears, but sometimes, according to Weve, are associated with retinal disinsertion. They are most frequently found in the inferior temporal zone, which location A. Fuchs has attributed to a congenital cause.

From a study of two personal cases and a review of the literature the authors conclude that retinal cysts may be absorbed or may rupture. The absorption may be spontaneous or may be hastened by subconjunctival injection of a 1-to-1000 solution of cyanide of mercury. The cyst may rupture internally (in the vitreous) or externally (toward the choroid). If it breaks into the vitreous its contents are absorbed and scar tissue results, with formation of new retinal blood vessels and a pigmented crescentic cicatricial line. Several clinical forms have been studied. These are multiple cysts, bilateral cysts, and a single cyst with detachment and disinsertion of the retina. The pathogenesis is obscure, but some cases have been associated with long standing iridocyclitis. Weve advises transcleral diathermic micropunctures of the cyst with evacuation of its contents, avoiding the complication of retinal detachment. Others believe that this is too radical. A review of the histologic features of the various forms is made, but more details are needed to complete our knowledge. (Illustrations, references.)

Derrick Vail.

Wilczek, Marian, Hippel-Lindau disease. *Klinika Oczna*, 1938, v. 16, pt. 4, p. 440.

A report of a case in a man 29 years of age, who came with a history of having lost vision of the right eye 1½ years earlier. This was followed by dizziness. Ocular examination revealed retinal detachment and posterior synechia in the right eye and choked disk in the left eye. A diagnosis of cerebellar tumor was made, but at operation no tumor was found. Four months later the left eye presented a typical picture of angiomatosis retinae. Ray K. Daily.

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Aronson, G. L. The effect of plasmocide on the eye. *Viestnik Opht.*, 1938, v. 13, pt. 2, p. 266.

A report of two cases of optic atrophy caused by administration of plasmocide, in one case in moderate therapeutic doses. Ray K. Daily.

Askalonova, T. M. The effect of therapeutic and toxic doses of plasmocide on the retina and optic nerve. *Viestnik Opht.*, 1938, v. 13, pt. 1, p. 26.

A report of a laboratory study on cats. The histologic sections show perinuclear vacuolation in the pigment epithelium, formation of vacuoles between the rods and cones and the pigment epithelium, degeneration of the reticular layers, and haziness of the ganglion cells. In the optic nerve, in addition to degenerative changes, there are inflammatory phenomena such as lymphoid infiltration and destruction of the myelin substance. Ray K. Daily.

Freusberg, O. Homonymous choking of one half of each disc in partial atro-

phy of the optic nerve after unilateral tract lesion. *Klin. M. f. Augenh.*, 1938, v. 100, Oct., p. 494.

A man of thirty years suffered for ten years from headache, vomiting, and epileptic attacks. Through a craniotomy a malignant small-celled glioma of the right frontoparietal lobe was resected. Left spastic hemiparesis and central left-sided paresis of the facial nerve followed, and later, rotatory nystagmus and left-sided homonymous hemianopsia. At autopsy the right primary visual centers were found to be destroyed. Clinically the process had caused a partial degeneration of the peripheral visual paths as shown by left homonymous tract hemianopsia. Then homonymous choked disc had developed in the undegenerated optic fibers. The right nasal papillary half attained a prominence of 4 D., whereas the temporal atrophic half remained at the retinal plane. In the left fundus a difference of level of both papillary halves had not definitely developed.

C. Zimmermann.

Hartman, E., and Guillaumat, L. The fundus picture in intracranial tumors, statistical study. *Ann. d'Ocul.*, 1938, v. 175, Oct., pp. 717-737.

Statistical analysis of the eye grounds in 1,169 patients with intracranial tumor, all verified at operation or autopsy. Gliomas within the brain produce papilledema in 76 percent; meningiomas compressing the brain, only in 40 percent. Tumors of the posterior fossa produce papilledema in 71 percent of the cases. Anterior tumors may produce papilledema without obstructing the aqueduct of Sylvius. Papilledema was found in 50 percent of the cases of encephalitis, but this figure is abnormally high because these pa-

tients were originally seen as brain-tumor suspects. John M. McLean.

Soriano, F. J., and Puiggari, M. I. Retrobulbar neuritis due to beriberi. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, May, p. 244.

A comprehensive review of the history of avitaminosis with respect to vitamin B1 is given, with particular reference to the optic nerve lesion, which is stated to be common among the Japanese. A single case of retrobulbar neuritis occurring bilaterally in a 57-year-old war refugee from Spain is given. There was no evidence of beriberi other than the retrobulbar neuritis. The etiologic diagnosis was based upon the history of malnutrition, the characteristic visual-field changes, and the exclusion of other possible etiologic factors such as tobacco-alcohol intoxication, multiple sclerosis, and diabetes.

Edward P. Burch.

12

VISUAL TRACTS AND CENTERS

Cotlier, I. Psychic concepts of hysterical amblyopia, and fundamentals of psychotherapy and prognosis. *Rev. Oto-Neuro-Oft.*, 1938, v. 13, June, p. 143.

The author gives a comprehensive review of the history of hysteria, with particular emphasis on the viewpoint of modern psychiatrists such as Janet, Charcot, Bernheim, Babinski, and Freud with respect to the ocular type. He feels that although patients afflicted with hysterical amblyopia see images perfectly they transform them by autosuggestion into negative sensory images. "The subject sees with his retina, but not with his cerebrum."

Successful therapy depends upon thorough examination of the patient's

psyche. Whatever type of treatment is undertaken must have for its object establishment of the patient's confidence in his physician. Post-traumatic cases should not receive compensation. In general the prognosis is favorable.

Edward P. Burch.

Mooney, A. J. Lesions of the visual pathway and their relation to neurosurgery. *Irish Jour. Med. Sciences*, 1938, v. 151, July, pp. 315-327.

The visual-field defects of a number of cases with proved intracranial lesions are reviewed, with the following conclusions. Perimetry is of great localizing value in chiasmal and subchiasmal lesions. Perimetry may be the first means of lateralizing a suprachiasmal lesion, but is of localizing value only when considered with the neurological findings. It is essential to follow up the postoperative visual recovery by accurate quantitative perimetry.

T. E. Sanders.

13

EYEBALL AND ORBIT

Anthony, D. H. An enucleation compressor. *Amer. Acad. Ophth. and Otolaryng.*, 1937, 42nd mtg., p. 484. (See *Amer. Jour. Ophth.*, 1938, v. 21, Jan., p. 100.)

Cuesta, Yañez C. Opticociliary neurectomy. *Rev. Oto-neuro-Oft.*, 1938, v. 13, May, p. 117.

The historical background of opticociliary neurectomy is outlined by the author. He describes the technique of the operation and cites five cases in which he has performed it. Three were in painful glaucomatous eyes, another was in a child suffering from panophthalmitis, and the last was in an elderly male with chronic iridocyclitis in an aphakic eye.

Edward P. Burch.

Khaldeev, S. I. Medvedev's method of conjunctivoplasty. *Viestnik Opht.*, 1938, v. 13, pt. 1, p. 105.

In four cases of shrunken socket with atrophic eyeball the author enucleated the atrophic eyeball, cut away the cornea and optic nerve, fashioned a flap from the sclera, and sutured it in the wound. In all cases the result was a socket large enough to hold a prosthesis.

Ray K. Daily.

Pilman, H. I., and Ilinski, D. T. The temperature induced in the depth of the human orbit by diathermy. *Viestnik Opht.*, 1938, v. 13, pt. 2, p. 244.

Two cases were studied, and the charted results show that therapeutic doses of diathermy do not produce any considerable rise in the temperature of the retrobulbar tissues.

Ray K. Daily.

Pimentel, P. C. A case of ocular malformation. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, April, p. 203.

A large, firm, globular mass protruded from the left orbit of an infant. It was removed surgically and was studied microscopically. The optic nerve was not involved and no tumor cells were present. The opinion is ventured that the anomaly was due to invasion of the choroidal cleft by mesodermal tissue elements. (Illustrated.)

Edward P. Burch.

14

EYELIDS AND LACRIMAL APPARATUS

Becker, Fritz. Membranous occlusion of the upper and lower ends of the nasolacrimal duct. *Klin. M. f. Augenh.*, 1938, v. 101, Oct., p. 569.

In two out of an annual average of 250 new-born Becker found on the second and third days of life, without noticeable disturbances of development, a

grayish-red cyst at the medial third of the otherwise normal lower lid. A probe was introduced into the lower canaliculus, and after the probe had penetrated the first occlusion at the entrance of the lacrimal sac a clear viscid fluid oozed out of the lower tear point. Then the probe penetrated the tough resistance at the lower end of the canal.

C. Zimmermann.

Cuesta Yañez, C. Treatment of dacryocystitis by iodine irrigations. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, May, p. 231.

Injection of iodine into the lacrimal sac and ducts for relief of acute and chronic dacryocystitis is reported in five cases. After preliminary anesthesia is established with 2-percent pontocaine solution, a Bowman sound is passed. The tubular sound of de Wecker with its accompanying mandril is passed into the nasal passage. The mandril is then withdrawn and an Anel syringe is employed to irrigate the lacrimal passage with iodine. As the first few drops reach the nose, the sound is withdrawn gradually, pressure on the plunger of the syringe being maintained to insure thorough irrigation of the lacrimal passages. Edward P. Burch.

Grustev, V. F. Functional tests of the lacrimal apparatus. *Viestnik Opht.*, 1938, v. 13, pt. 3, p. 402.

The series of tests proposed to determine the function of the lacrimal apparatus are Schirmer's test, the iodine-starch test, response to irritation of eye and nose, and determination of nasal permeability.

Ray K. Daily.

Hollwich, F. Deficiency of lacrimal secretion in small children. *Klin. M. f. Augenh.*, 1938, v. 101, Oct., p. 570.

Physiologically the secretion of tears

is lacking in the infant up to the third or fourth weeks and then sets in gradually. A girl of eighteen months did not shed tears when crying. Under psychical influences the eyes became red but no tears came. Histologic examination of a few lobules of the lacrimal gland showed only hyalin changes of the secretion in some ducts. The skin of the face was dry and peeled off easily in small scales, and the mucous membranes of the nose and throat were dry and showed a tendency to dry catarrh. A congenital disturbance of development of the secretory nerves of the otherwise normal lacrimal gland was assumed.

C. Zimmermann.

Klauber, E. Neurofibromatosis of the eye. *Klin. M. f. Augenh.*, 1938, v. 101, Oct., p. 576.

In 1930 a mentally inferior boy of four years showed an elephantiasis-like thickening of the right upper lid. In 1937 the mentality had improved, but the lid hypertrophy was more striking. Extensive excision produced cosmetic and functional improvement. Histologically the excised piece showed diffuse polynuclear fibromatous proliferation enclosing sebaceous glands, the whole resembling neurofibromatosis. The father had numerous skin proliferations of Recklinghausen type.

C. Zimmermann.

Korkashvili, L. G. Slitting the lacri-

mal punctum. *Viestnik Opht.*, 1938, v. 13, pt. 3, p. 405.

For years the author has obtained satisfactory results in epiphora by excising a segment of the posterior wall of the lacrimal canaliculus.

Ray K. Daily.

Offret, G., and Duperrat, R. Ocular manifestations of mullussum contagiosum. *Arch. d'Opht. etc.*, 1938, v. 2, Nov., p. 993.

Mollusum contagiosum localized in the palpebral skin has been recognized for many years. That it can be the cause of severe conjunctivitis or keratoconjunctivitis has not been sufficiently understood. The palpebral type is not easily recognized since it is not always hemispheric, umbilicated, or slow in developing—characteristics of the skin lesions elsewhere. Sometimes it is only slightly elevated, is hidden between the cilia, and may be multilobular. Basing their conclusion on forty cases found in the literature, the authors classify the ocular lesions as (1) conjunctivitis, most frequent and which may be confused with trachoma; (2) keratoconjunctivitis, which may seriously involve vision; and (3) conjunctival tumors, which are very rare and do not produce much irritation. Treatment is by excision or by opening the lesion and sterilizing the interior. A filterable virus is believed to be the cause. (Illustrations, bibliography.)

Derrick Vail.

NEWS ITEMS

EDITED BY DR. H. ROMMEL HILDRETH

640 S. Kingshighway, Saint Louis

News items should reach the Editor by the twelfth of the month.

DEATHS

Dr. Richard Cecil Smith, Superior, Wisconsin, died October 30, 1938, aged 52 years.

Dr. William Humphrys Miller, Terre Haute, Indiana, died October 4, 1938, aged 56 years.

Dr. William Kennedy Butler, Washington, D.C., died October 17, 1938, aged 81 years.

Dr. Willis Bryant Moulton, Portland, Maine, died October 8, 1938, aged 76 years.

Prof. Oscar Oblath, Triest, died June 29, 1938, at the age of 63 years.

MISCELLANEOUS

The sixth Postgraduate Ophthalmological Course was given at the Cleveland Clinic, December 6, 7, and 8, 1938, under the direction of Dr. A. D. Ruedemann, Ophthalmologist in Chief of the Cleveland Clinic. The guest speakers were: Dr. Arnold Knapp of New York City, who spoke on The selection of surgery in glaucoma, and on Ophthalmological developments in the past quarter century; Dr. Avery D. Prangen of the Mayo Clinic, who spoke on Refinements of refraction, and on Types of myopia and management; Dr. Conrad Brens of New York City, who spoke on The results in the treatment of aniseikonia and on The relation of arthritis to eye conditions; and Dr. John Gipner of Rochester, New York, who spoke on Eye muscles and on The treatment of presbyopia. The final speaker of the course was Dr. Wherry of Omaha, Nebraska, who spoke on My son studies medicine. The attendance during the course was 85.

The appointment of Dr. J. Warren Bell as Medical Director of the National Society for the Prevention of Blindness has been announced by Lewis H. Carris, Managing Director of the Society. Dr. Bell was formerly Director of Maternal and Child Health in the State of Nebraska. Before that, he was Director of the Division of Maternal and Child Health in Cattaraugus County in New York State. A native of Minneapolis, Dr. Bell holds degrees of B.S., M.D., and Ph.D. from the University of Minnesota where he was also an instructor and teaching fellow. He served during the World War in the Medical Corps of the 86th Royal Field Artillery Brigade, A.E.F., B.E.F. Dr. Bell is a member of the American Medical Association, a fellow of the American Public Health Association, and a member of the Buffalo, New York, Academy of Medicine. Mr. Carris also announced that Dr. John L. Rice, Commissioner of Health of New

York City, has accepted membership on the Society's Board of Directors.

The National Society for the Prevention of Blindness has announced the appointment of a Nursing Advisory Committee, headed by Miss Katharine Tucker, Professor of Public Health Nursing in the School of Education, University of Pennsylvania. The committee has been selected to represent the various fields in nursing, such as nursing education—graduate and undergraduate—and public-health nursing in its many phases. Each of the federal nursing services is represented by its director. In addition to Miss Tucker, the committee includes: Miss Josephine McLeod, Secretary-Treasurer of the Virginia State Board of Examiners of Nurses, Richmond, Virginia; Miss Ruth Sleeper, Assistant Principal, School of Nursing, Massachusetts General Hospital, Boston, Massachusetts; Miss Cora Shaw, Institute of Ophthalmology, Presbyterian Hospital, New York, New York; Miss Naomi Deutsch, Director of Public Health Nursing, Children's Bureau, Washington, D.C.; Miss Pearl McIver, Senior Public Health Nursing Consultant, United States Public Health Service, Washington, D.C.; Miss Elinor D. Gregg, Director of Nursing, Office of Indian Affairs, Washington, D.C.; Miss Mary B. Hulsizer, Instructor in School Hygiene, Board of Education, Newark, New Jersey; and Miss Marguerite Wales, Consultant in Nursing Education, W. K. Kellogg Foundation, Battle Creek, Michigan. The committee met with Miss Eleanor W. Mumford, Associate for Nursing Activities of the National Society for the Prevention of Blindness, in New York City on December 1, 1938, at which time it was decided that, as a first step, the committee should undertake an analysis of nursing functions which contribute to the conservation of sight.

The Society in addition announces the following report published on one-eyed drivers. One to two percent of drivers are completely blind in one eye, but a more serious problem is presented by the fact that between 20 and 40 percent of all motorists have a deficient eye which handicaps them. No state prohibits either group from driving. This is brought out in a report on "One-eyed drivers," in the current issue of *The Sight-Saving Review*, quarterly journal of the National Society for the Prevention of Blindness. The authors of the report—H. R. DeSilva, W. H. Frisbee, Jr., and P. Robinson—are Research Associates

in the Institute of Human Relations at Yale University.

"Only about 20 states make any check on vision for the driver's license," the report says. "There is, however, no agreement regarding visual standards. A reason for the absence of uniformity lies in the lack of attested facts on the part played by vision in driving. The standards suggested by different individuals or agencies do not conform with one another. The fact that they vary among themselves and are based upon insufficient research shows the need for further investigation."

The authors reached the conclusion that "most one-eyed and deficient-eyed drivers are oblivious to the defects which predispose them to accidents. The greatest human hazard arises not from the defects but from ignorance of the dangers from such defects. For most of these drivers the solution lies in personal reëducation adapted to their individual needs. For others, and especially those who have shown themselves incapable of profiting from reëducation, the solution lies in revocation of their licenses."

The one-eyed person is particularly handicapped in night driving, the report points out, adding: "Not only is a one-eyed person more sensitive to glaring lights, but it takes him much longer to recover from the glare and to see the road clearly again. The one-eyed motorist should drive as little as possible at night."

"The field of vision for a one-eyed individual depends partly upon the protrusion of his good eye and the bridge of his nose. The person with pop-eyes and a small nose will naturally see farther around his nose than a person with deep-set eyes."

"The most obvious compensation for the handicap of having one eye is for the driver to keep his head turned at an angle so as to spread his visual field evenly on both sides. Many one-eyed persons do not compensate nearly enough, since turning the head attracts attention and they are anxious to conceal their defect."

"Another form of correction possible is to keep the head and the eyes roving continually from right to left while driving in order to bring possible dangers from the side into the field of clear vision of the good eye. This habit is unfortunately not common enough among one-eyed persons. The hazards of driving are not the same for the right-eyed and the left-eyed driver, since we steer our cars from the left-hand side and drive on the right side of the road."

The George Washington University School of Medicine, Washington, D.C., announces an intensive postgraduate course in ophthalmology, April 10 to 15, 1939, inclusive. In addition there

is offered a special practical course limited to 25 participants, April 4 to 8, 1939, inclusive. These courses are given by the resident staffs of George Washington University School of Medicine and the Army Medical Museum, and by 17 guest lecturers. For further details apply to the secretary, Miss Louisa G. Wells, 927 17th Street N.W., Washington, D.C. Several members of the American Board of Ophthalmology have consented to interview those taking the course who are prospective candidates for the Board's examination. Information regarding the method and scope of examination will be given.

SOCIETIES

The Eye Section of the Philadelphia County Medical Society held a meeting on January 5, 1939, as follows: Case reports by Dr. Homer Mather and Dr. Ronald C. Moore. Dr. George P. Meyer spoke on Uveal tuberculosis and Dr. Van M. Ellis read a paper on History of sutures used in cataract surgery.

Immediately preceding the Annual Congress of the Ophthalmological Society of the United Kingdom on April 20, 1939, the following meetings will be held at the Royal Society of Medicine, 1 Wimpole Street, London, W. 1: International Association for the Prevention of Blindness (Address 66 Boulevard Saint-Michel, Paris VI). On Wednesday, April 19, the subject will be: The application of the Credé method for the prevention of ophthalmia neonatorum in various countries. The speakers will be Dr. Sinclair (Edinburgh); Professors Terrien (Paris), v. Szily (Munich), Maggiore (Genoa), Vasquez Barriere (Montevideo); Dr. Wilson (Cairo), Dr. Cardell (London), Dr. C. Berens (New York). The International Organization Against Trachoma (address 33 Welbeck Street, London, W. 1), on Wednesday, April 19, at 4:30 p.m. will discuss the subject: The incidence and clinical type of trachoma met with in Europe and North and South America, that is in countries which are commonly considered to be non-trachomatous. The speakers will be Dr. Lavery (Dublin), Dr. Harry Grandle (Chicago), Mr. Arnold Sorsby (London). Subsequently there will be a short discussion on the treatment of trachoma by sulfaphenylamide and its congeners. Members of the Congress are invited to attend these meetings. Ophthalmologists from abroad are invited to attend all meetings of the Congress.

The North of England Ophthalmological Society held its course of annual lectures at the Royal Eye Hospital, Manchester, January 20, 21, 1939, with Professor H. E. Roaf lecturing.

MELANOSARCOMA OF THE IRIS

WILLIAM BROWN DOHERTY, M.D.

New York

The subject of malignancy is not new, but there can be no question that there seems to be an increase in this terrible affliction. In the clinics at the New York Eye and Ear Infirmary melanosarcomata of the uveal tract are by no means rare, but a similar condition affecting the iris is of rather unusual occurrence. It is for this reason that I feel justified in reporting these cases.

Because of the frequency of melanotic sarcoma, the subject of melanosis in ophthalmic literature has of late attracted increased attention, especially in its relation to general metabolism and to the normal functions both of the skin and eyeball. Melanomata, pigmented nevi or moles are either developmental defects or acquired new formations which, for a time benign, undergo slow changes ending in malignant disease. The melanotic pigment, melanin, is now recognized not merely as a side product but is thought to be connected with disturbances of cell metabolism. Localized in special cells, and apparently benign, this pigment seems at times to take some part in the development of malignant extension. Melanotic affections which commence in the eyelids and conjunctiva—extraocular melanomas—present characteristics similar to melanomas of the skin. They are amenable to the same treatment; that is, excision and treatment with radium and the X ray. Intraocular melanotic sarcomata are often beyond the control of surgery once metastasis has actually begun. The removal of

the affected eye often does not prevent the individual from ultimately dying of this affliction. The possibility of distinguishing a disturbance of intraocular pigmentation from an intraocular melanoma changing slowly into a melanotic growth is a consideration from a clinical point of view, and some forms of therapy or surgery present the only hope of preserving the eye and of preventing extraocular extension. There are about 175 cases of iris sarcomata on record and these growths may be pigmented or unpigmented. Of the pigmented group some definitely start in large pigmented nevi which have been noted previously, and there are others which may have started in the stroma of the iris and may have had their origin from small nevi which, being deeply seated, escaped notice. Most of the tumors consist of large spindle cells, and these spindle cells are characteristic of growths derived from nevi.

Melanosarcoma of the iris is most frequent between the ages of 35 and 55 years, and according to statistics is of more frequent occurrence in females than in males. The lower half of the iris is also more frequently affected than the upper. It is difficult to state whether the tumor starts at the root of the iris or in the neighborhood of the ligamentum pectinatum, since these structures usually become rapidly involved with the growth. The beginning of these tumors presents varying clinical appearances which are in all probability due to the site of their origin. In a defi-

nite pigmented nevus the extension is noted by an increase in the size of the tumor, whereas if starting in the deeper layers of the iris near its root the growth

growth to metastasize around the angle of the anterior chamber produces a type of growth known as ring sarcomata of the iris. These cases have been recorded by Werner,¹ Parsons,² Li,³ and others.

Case 1. Melanosarcoma of the iris starting from a benign nevus. G. W., aged 35 years, an Italian with dark complexion, stated that as a child he had always noted a dark pigmented spot on the colored part of his right eye and that he was equally sure that the two pigmented areas on the sclera near the exit of the anterior ciliary vessels were also present as long as he could remember. From his description there could be no doubt but that from early childhood he had had a well-marked melanoma of the iris with two melanotic patches on the sclera below. He experienced no trouble with his eyes until four months previous to his visit to the clinic at the New York Eye and Ear Infirmary, his only discomfort being a gradual loss of vision with no pain. The drawings (fig. 1) well illustrate the ocular condition upon his arrival at the hospital. The whole tumor gives the impression of springing from a melanoma of the iris.



Fig. 1 (Doherty). Case 1, showing lobes of the tumor. Notice small white area in lower part of mass, and pigment spots on sclera.

may spread beneath the stroma and cause varying discolorations which vary from a light yellow to a brown or brownish black. These growths have a tendency to metastasize into the fibers of the ligamentum pectinatum and canal of Schlemm, giving rise to increases in tension. In some cases the tendency for the

It consists of five different areas which are worthy of description. 1. From the patient's statement the temporal side of the mass seemed to be the remains of the old melanoma which was of a cinnamon color. 2. A small round brownish-black colored mass could be seen projecting from behind the iris. 3. There was a large mass of prac-

tically the same color as the mass on the temporal side projecting anteriorly into the anterior chamber. 4. Below, was a larger lobule of the tumor, very much darker in color than any of the other lobes, in the lower part of which there was a small white area. 5. The nasal side of the growth was of the same color as the temporal side and consisted of a number of small lobules. The tension of the eye was 28 mm. Hg.

The patient was informed of his condition and advised to have the eye removed. He desired to consider the matter and returned again to the hospital in 10 days. His eye at this time presented an entirely different picture. He had considerable pain; the cornea was steamy; and a large hemorrhage was present in the anterior chamber. The tension of the eyeball was 56 mm. Hg. The two small melanotic spots in the sclera below disclosed a rather unusual picture. The anterior ciliary vessels were markedly engorged and the two isolated spots were distinctly raised and had the appearance of two small round black beads or two vessels that had been pumped full of black ink. Enucleation was again advised, to which the patient readily consented. The eyeball was removed under local anesthesia and a histological report of a section of the eye was made as follows:

The tumor occupied the region of the ciliary body. It had caused an iridodialysis in addition to replacing the iris on one side. Posteriorly it extended into the choroid for a distance of one centimeter. The cells were uniformly packed with brown or black pigment granules which were so abundant as to obscure their outlines. There were a number of blood vessels and large blood spaces scattered through the tumor. An examination of the depigmented slide revealed an outline of the cells. They were large, oval and round, and disposed in a diffuse man-

ner. The pigment had been largely removed from the central area of the mass, but only partially from the extensions of the choroid and iris. In these locations the pigment occurred densest in the untreated preparations.

I am sorry that an examination of the urine for melanin was not made.

Case 2. I am reporting this case

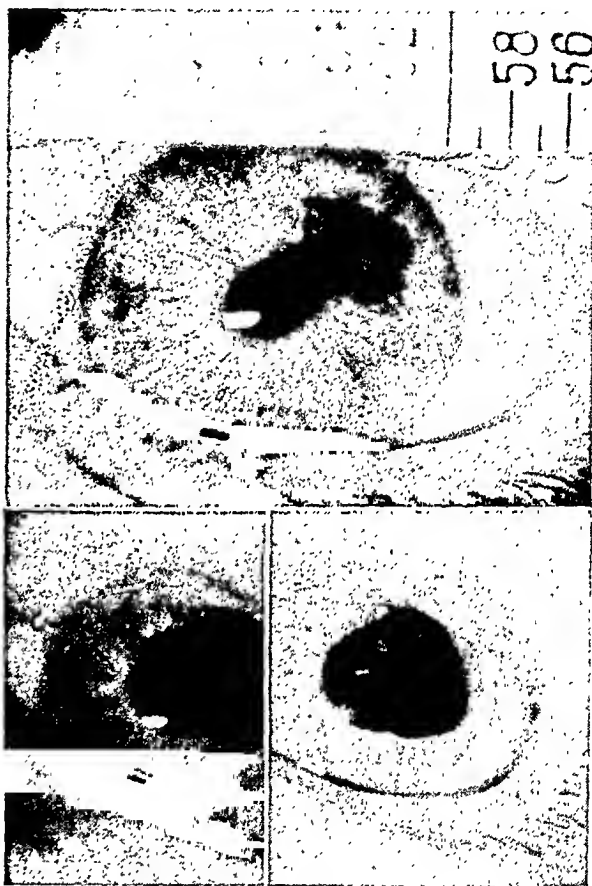


Fig. 2 (Doherty). Case 2. Above, showing appearance of tumor before operation. Below, showing appearance of iris after operation. Notice small area of growth on lower pillar.

through the kindness of Dr. LeGrand H. Hardy of New York City whom I assisted at the operation in 1930. Mr. W. V., aged 60 years, complained of ocular fatigue upon reading and close work. His general medical history was negative, and there was no history of malignancy in any of his immediate family. He said that he knew he had a spot on the right iris but had absolutely no idea of its duration. Ex-

amination of the right eye was negative in all respects with the exception that the pupil appeared slightly eccentric, pear-shaped, with the apex down and out. A 3-by-3-mm., partially pigmented mass was present at the pupillary border; by oblique illumination it was seen to be spherical and there were several small pigmented spots on the anterior capsule of the lens. The pupil reacted normally to light; the root of the iris seemed clear; the mass apparently was limited within the minor circle. The pupil dilated with atropine, and by transillumination the mass appeared to be partially cystic. The patient was informed of the seriousness of the condition and readily agreed to operative procedure.

Because of the location of the mass on the pupillary border of the iris it was first determined to remove it *in toto* and have it examined; then if it proved to be merely a cyst no further operative procedure would be necessary. The eye was operated on under local anesthesia at the New York Eye and Ear Infirmary, a wide keratome incision being made and extended below with the scissors. The tumor upon being grasped with iris forceps collapsed. The tissue retained within the forceps was withdrawn, pulled upward, and the lower pillar was cut; then downward, and the upper pillar cut; finally, stretching from the base, the root of the iris was severed. At the end of this procedure a pigment spot was seen remaining on the lower pillar. As the anterior chamber was collapsed and the mass appeared to be a cyst it was decided it would be wiser to wait for the pathologist's report rather than risk injuring the lens capsule. An iridectomy on the lower pillar was to be considered later.

The microscopical report on the tissue section was as follows: The specimen submitted consisted of interlacing bundles of oval and spindle cells. Certain

areas revealed a considerable degree of pigmentation, the dark black granules being mostly intracellular. A number of small oval and round cavities were seen throughout the growth. They appeared to be cystic degenerations with walls of tumor cells. The mass was situated mostly on the anterior surface of the sphincter muscle. Vertices of the anterior limiting layer of the iris were visible. Posteriorly, the tumor cells had penetrated between the plate of connective tissue behind the sphincter, reducing it to cloudlike masses of hyalinized tissue. Moreover, the growth appeared to have proliferated around the pupillary area where it must have interposed itself between the iris and lens capsule. The two layers of pigmented cells were readily identified. At one point they seemed to have been separated from each other.

After studying the sections the pathologist advised enucleation. The tumor could apparently be removed *in toto*, but the lack of security and subsequent apprehension made enucleation advisable. The patient agreed that he would rather lose the eye in spite of its perfect vision than be anxiously on the watch for further occurrences. This procedure was carried out, and the lower pillar of the iris examined microscopically presented marked evidences of the original tumor.

Case 3. Seen in consultation with Dr. E. C. Hartman of Parkersburg, West Virginia. In March of 1930 I received a photograph from Dr. Hartman with the following history: Mrs. B. F. B., aged 42 years, had a negative family history. Her past history was irrelevant with the following exception. In 1925 for several months she had had severe headaches on the right side of the head. Dr. Joseph E. J. King of New York City performed a decompression operation and an exploration of the cortex of the brain, but found no pathology. The headache, however,

ceased after this operation. The patient had been married 20 years but had no children.

About 1926 the patient noticed a colored spot on the ciliary margin of the right eye which remained the same size for four years and then began to grow rapidly. The vision remained normal. The general physical examination was negative, the patient being a well-nourished white, adult female weighing 200 pounds; and her height was 67 inches.

From the appearance of the tumor this case seemed to be one of melanosaarcoma of the iris and we both advised enucleation at once. This advice was proposed to the patient, who refused any operative procedure. The tumor continued to grow, and in October, 1931, her eye presented the following appearance: The original growth had increased in size until it was within a few millimeters of the pupillary border; there were also a number of islandlike extensions into the periphery of the iris, and with the slitlamp an almost perfect outline of the large and small vascular circles and some of the connecting branches could be made out. This picture presented itself as minute dots of brown powderlike pigment which were arranged as previously stated. These were situated either in the veins or in the lymphatics, but no definite vessel wall could be observed. The mass did not transilluminate, the tension was 28 mm. Hg, and the general clinical appearance now was that of a ring melanosaarcoma of the iris. Dr. Hartman again advised enucleation, to which she consented.

The following is a report of the pathological examination made by Dr. Bernard Samuels at the Eno Laboratory of the New York Eye and Ear Infirmary: There was some shrinkage of the globe due to the fixation. The anterior stretches of the choroid, the entire ciliary body, and about one half of the iris were replaced on one

side by a highly pigmented new growth. Externally the growth lay firmly on the sclera. It had infiltrated the ligamentum pectinatum and filled with Schlemm's canal. Toward the median line tumor cells were traced anteriorly to Descemet's membrane, to a point beyond the ring of



Fig. 3 (Doherty). Case 3. Above, showing size and position of tumor. Below, stereoscopic photographs taken about 1½ years later, showing the rapid enlargement of the growth, with metastasis around the iris somewhat resembling huge melanomata.

Schwalbe. Extensions of the tumor occurred in the pupillary regions on the opposite side and in the root of the iris and the ligamentum pectinatum.

The growth was composed of small oval cells arranged in interlacing bundles. Pigment epithelium, lining the inner surface for a considerable distance, stood out in contrast. The growth entirely filled out the anterior chamber on this side. The pupillary zone of the iris was directed backward. The tumor touched the lens, causing some pressure atrophy. The retina showed two systems of cystic degeneration, one anteriorly cystic degeneration

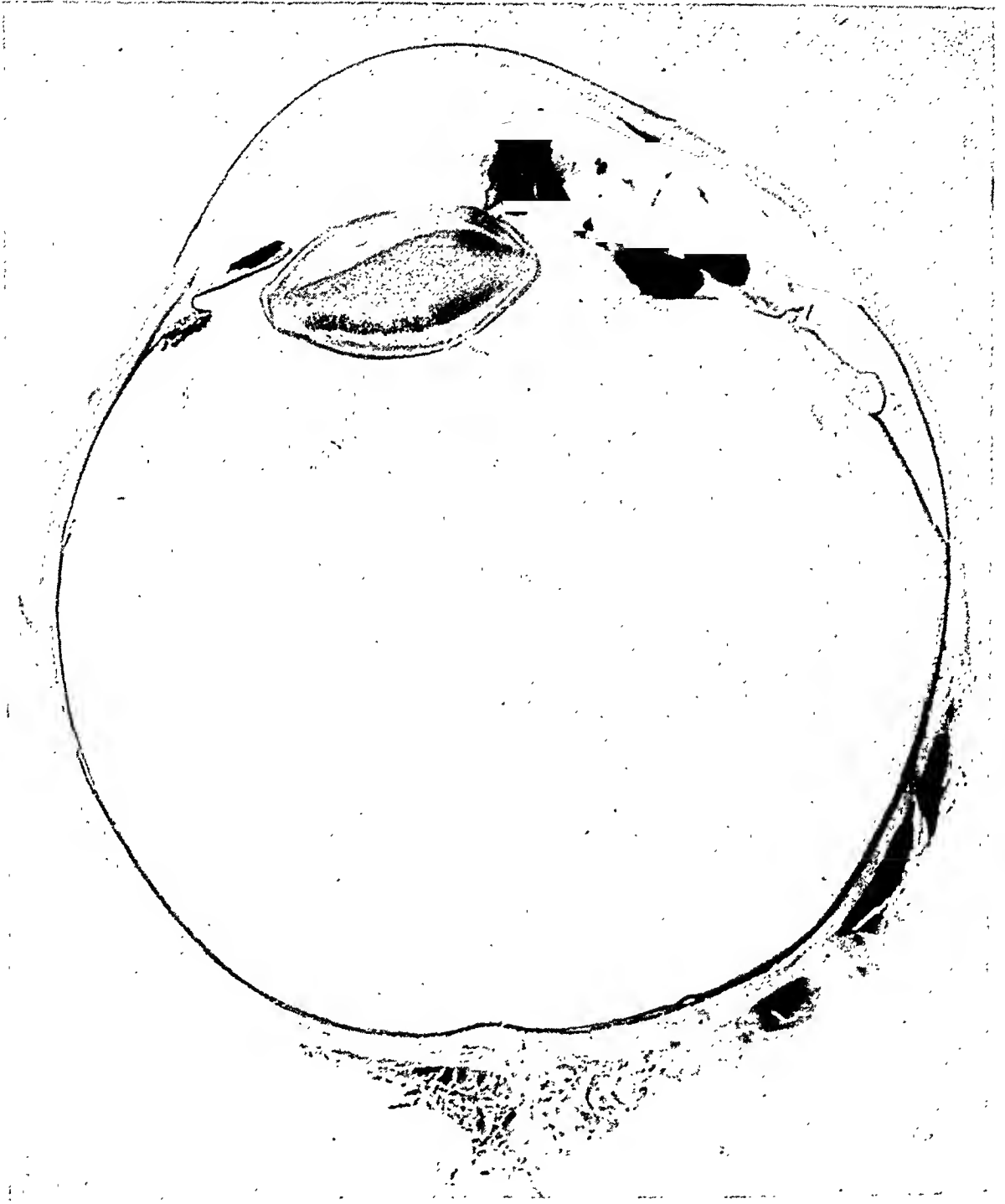


Fig. 4 (Doherty). Case 3. Microscopic section of enucleated eye, showing melanosarcoma involving the iris, ciliary body, and choroid, with metastatic tumor on iris of opposite side.

of Iwanoff, which on the side of the tumor extended well beyond the equator. In the posterior segment the second system of cystic degeneration took place in the macular region. The sections did not include the optic nerve, as the nerve was in the macroscopical section. Diagnosis.

Melanosarcoma of the choroid, ciliary body, and iris, with cystic degeneration of the retina.

CONCLUSIONS

1. From the histories of these tumors it is reasonable to suppose that they are

less malignant than those of the choroid or ciliary body. This may be due to the fact that they are more easily observed, and immediately operated upon.

2. A beginning malignancy of a melanoma of the iris, as viewed from a clinical standpoint, would manifest itself by (1) an increase in size; (2) varying discolorations in the same growth; (3) an increased blood supply; (4) elliptical pupil and development of tension.

3. A cyst and a melanosarcoma may co-exist.

4. The so-called ring sarcomas are extensions around the iris from the primary growth.

The question whether pigmentation plays a role in the malignancy of these growths is a much disputed one. I believe it does. A deeply pigmented growth with pigment running wild must mean something. It is true that we do have malignant leucosarcomas, but do they metastasize very rapidly, and do they not occur most frequently in the young?

150 West Fifty-fifth Street.

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MECHOLYL AND PROSTIGMINE IN THE TREATMENT OF GLAUCOMA*

SAMUEL T. CLARKE, M.D.

Boston

It is the purpose of this paper to present two new drugs for use in the treatment of glaucoma, particularly of the subacute and acute types, and to discuss briefly the rationale behind present-day therapy in that disease. The new drugs which, so far as I can discover from the literature, have never been used very extensively, if at all, in glaucoma, are Mecholyl (methyl-beta-acetylcholine-chloride), sold by Merck and Company, and Prostigmine ($(\text{CH}_3)_2 \text{N} \cdot \text{CO} \cdot \text{OC}_6\text{H}_5 \cdot \text{N}(\text{CH}_3)_3 \text{SO}_4\text{CH}_3$) sold by Hoffmann-LaRoche Company.

First let us consider the drugs most commonly employed at the present time for the treatment of glaucoma: pilocarpine, eserine, and the epinephrine compounds. The way in which they reduce tension has never been completely and satisfactorily explained, but probably is about as follows:

MIOTICS

Most authors on glaucoma believe that the miosis frees the angle of the anterior chamber and thus facilitates passage of aqueous through Schlemm's canal. In addition, there may be involved specific action on blood vessels and on the formation of aqueous, since these miotics have sometimes been found to reduce tension in the glaucoma of aniridia, in secondary glaucoma with blocked pupil, and in long-standing chronic glaucoma with completely closed iris angle. Their action in these cases is not always dependable.

Pilocarpine. Pharmacologically the primary action of pilocarpine depends upon direct chemical stimulation of the cells in effector organs innervated by the parasympathetic nervous system. A prevalent theory claims the action of pilocarpine to be that of stimulation of the end organs of the parasympathetic. This view is quite fallacious, as can be shown by cutting the nerve supply to an effector organ of the parasympathetic and allow-

*From the Massachusetts Eye and Ear Infirmary. Read before the New England Ophthalmological Society, November 15, 1938.

ing ample time (about two weeks or more) for complete degeneration of all nerve endings and nerves to take place. If pilocarpine is then administered, a greater reaction will be seen to occur than that previous to nerve section, which goes far to disprove that hypothesis. From the best available evidence the action of pilocarpine is directly upon the end organs themselves.¹ Included with this is a slight vaso-dilatory action. It is most effective when used on a glaucomatous eye having a relatively dilated pupil, and when good miosis is obtained following its use. Pilocarpine is the most effective and generally used drug for chronic simple glaucoma.

Eserine is a more powerful and more lasting miotic than is pilocarpine, exerting a strong action for two or three hours. Physiologically the mechanism of its action is different from that of pilocarpine. It seems to depend on its "acetylcholinesterase" inhibiting action, together with certain specific action on parasympathetic effector cells.² The urethane groups in eserine combine with esterase and make it ineffective. This allows the acetylcholine to accumulate by preventing its normal destruction: thus the concentration is increased; hence the cholinergic action is increased. The action of eserine on blood vessels, similar to that in the case of pilocarpine, is one of moderate dilatation. It is a marked synergist to mechoyl, doryl, and other cholinergic drugs. Its disadvantages are that it causes symptoms of hypersensitivity, deteriorates relatively rapidly, and is frequently very unpleasant to the patient, due to the rapidity and strength of its action. Relatively few patients are found who can tolerate long-continued eserine therapy.

EPINEPHRINE COMPOUNDS

Ordinary adrenalin first used by Hamburger (1923) in subconjunctival doses

was supposed to cause a fall in tension, in spite of the mydriasis produced, due to vaso-constriction of the vascular uveal coat; the loss of blood producing a reduction in the volume of the intraocular contents. However, since the maximal effect was noted 12 to 24 hours after the treatment and long after the vaso-constriction had disappeared, Hamburger later concluded that the vaso-dilatation which succeeded was responsible for the effect; the active hyperemia flushing out the capillary bed and perhaps carrying away a certain amount of accumulated intraocular fluid. This explanation is perhaps as good as any other.³

The injections originally given were 4 min. of 1/1000 adrenalin, injections usually being made under the conjunctiva at the temporal side of the globe so as to be near the ciliary ganglion. Such treatments cause a rise in blood pressure generally and in some patients are accompanied by unpleasant systemic symptoms. Hamburger substituted for the ordinary levo-rotatory adrenalin, the synthetic dextro-rotatory adrenalin, which had the same effect on tension but none on blood pressure. This was also used by subconjunctival injection and given the very suggestive name, "Glaukosan."

Since then many different adrenalin compounds have been advocated by various workers and found to be effective by instillation. Among these may be mentioned 1- to 2-percent adrenalin borate or tartrate.

Because it was found that attacks of acute glaucoma not infrequently followed the use of adrenalin, even when used in combination with miotics, certain definite contraindications to its use became recognized. Gifford says that it should never be used in acute or hemorrhagic types of glaucoma and is very sceptical of its value in glaucoma secondary to uveitis.

The ill effects found in these cases are most likely due to the mydriasis which may block the iris angle and hinder filtration. As regards glaucoma, adrenalin compounds have found their greatest usefulness in chronic simple glaucoma, especially when associated with aphakia.

The unpredictability of the action of adrenalin compounds is physiologically explained by the fact that small doses of adrenalin frequently dilate the smaller blood vessels while larger doses do the reverse, and extremely large doses produce great hyperemia by paralyzing all the blood vessels. This varied action combined with the possible effect of mydriasis upon the iris angle makes adrenalin a very uncertain remedy. It is also a very expensive, rapidly deteriorating drug, and occasionally causes a great deal of pain, especially when used in secondary glaucoma.

Theoretically, any drug which either paralyzes the action of the sympathetic nervous system or mimics that of the parasympathetic might be of use in glaucoma. On looking for a possible parasympathetic-mimetic drug, acetylcholine seemed to me to be the logical choice to try as a new drug in the treatment of glaucoma. One other new drug, namely prostigmine, also seemed worthy of trial, as its action closely follows that of eserine.

ACETYLCHOLINE

Acetylcholine or a similar substance is assumed to be produced at all parasympathetic nerve endings and is considered to be the substance responsible for the action of the effector organ.⁴ It is even produced in the sympathetic synapses, although not at the sympathetic nerve endings at the effector organ, where sympathin is formed. The action of acetylcholine is only momentary. This is due to its rapid inactivation by hydrolytic

splitting into choline and acetic acid by the action of an enzyme "acetyl-choline-esterase," which is found in the blood stream and in the tissue juices but not in the normal aqueous. The esterase rapidly appears in the aqueous after disturbances such as paracentesis. This has been proved by experiments on cats.⁵

A cat's blood pressure is lowered quite readily by acetylcholine, but this effect is prevented if aqueous is added to the acetylcholine solution, because the esterase, brought to the aqueous by the trauma of paracentesis, destroys the acetylcholine. This hydrolysis of the acetylcholine can be abolished by the addition to the aqueous of eserine, which prevents the esterase from destroying the acetylcholine. The esterase obtained by the trauma of the paracentesis probably comes into the aqueous primarily from the vitreous, which has a high esterase content, and to some extent from the iris and ciliary body.

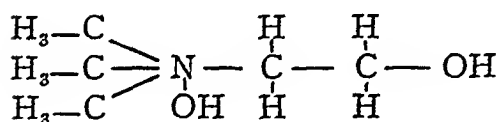
Physiologically, acetylcholine is a rapidly acting, strong miotic, although its effect is of very short duration. Cholinergic drugs are all extremely potent vaso-dilators. This latter action occurs on vessels of all caliber and accounts for the good results reported from its use in Raynaud's disease, Buerger's disease, chronic arthritis, and other peripheral vascular diseases.

Uses of mecholyl: 1. Peripheral-vascular disease. 2. X-ray gastrointestinal series. 3. Paroxysmal tachycardia. 4. Postoperative urinary difficulties. 5. Postoperative gastrointestinal distention. 6. Spasm or embolus of the central retinal artery.⁶ 7. Arthritis.

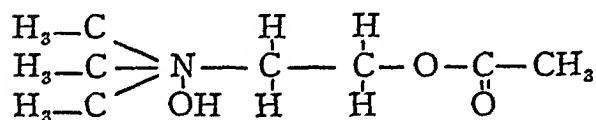
When used in arthritis by the method of iontophoresis, there is, at the site of application, where peripheral vascular spasm has been present, an increase in skin temperature of 4 to 10 degrees Fahrenheit which persists for several

hours. This vaso-dilatory action can be observed directly under the microscope in animals and seems to be greatly enhanced by massage at the site of injection.

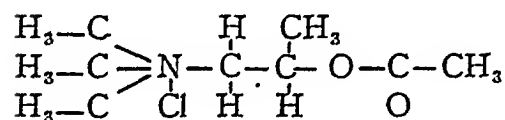
Clinically, it is not practical to use acetylcholine because its action is too evanescent. A synthetic drug, mecholyl (Merck), intimately related both chemically and physiologically to acetylcholine, was therefore chosen, instead. The chemical similarity is here shown:



Choline



Acetylcholine



Acetyl-beta-methylcholine
chloride
(Mecholyl)

Mecholyl occurs as a fine, white, crystalline substance that is freely soluble in water. It forms a bitter solution that is relatively stable to heat. The crystals are very hygroscopic and must be protected from atmospheric moisture, but once put up in solution will be effective for as long as a month. Mecholyl has been administered in general medicine by iontophoresis, by mouth, and by injection intramuscularly, but cannot be used intravenously.⁷ It is similar to acetylcholine in action, but is much more powerful, and its action persists for a much longer period. Furthermore, it is devoid of the so-called "nicotine" effect of acetylcholine.

In common with acetylcholine it contracts the pupil, increases the heart rate, lowers blood pressure, constricts the bronchioles, stimulates the activity of the sweat glands and of the secretory glands of the gastro-intestinal tract, increases intestinal tone, stimulates peristalsis, con-

tracts the detrusor muscles of the bladder and anal sphincters, and dilates all the blood vessels of the peripheral vascular system.^{8, 9, 10}

It is a direct physiological antagonist to adrenalin and atropine. After injection, its general effect comes on within 2 minutes and passes off after 20. Large subcutaneous doses make subjects very uncomfortable. Asthmatic attacks and even death can be produced in patients

subject to asthma or other pronounced allergy. Nausea and vomiting are common when large doses are administered and there is a very pronounced fall in blood pressure.

The systemic effects of mecholyl may be instantly abolished by means of 1/100 grains of atropine sulphate given intravenously; and over a period of 5 to 10 minutes, if the atropine is given subcutaneously.

Clinical action of mecholyl, in one respect, is apparently somewhat similar to that of adrenalin, if one accepts Gifford's theory of the action of adrenalin; namely, that it causes an active hyperemia of the ocular vascular bed which carries away accumulated and relatively stagnant blood in the smaller blood vessels. In addition, mecholyl is without the dangerous mydriatic action of adrenalin and it has the decided advantage of being a strong miotic.

Although there is no definite proof

available at the present time, it is my opinion that eventually the action of many of our antiglaucomatous drugs will be found to lie in their effect upon the formation or absorption of aqueous.

My use of the drug at the Massachusetts Eye and Ear Infirmary was started with retrobulbar and subconjunctival injections in acute and subacute cases of simple and congestive glaucoma, and the results were so striking that a 20-percent solution as drops was tried. Retrobulbar injection was found preferable to subconjunctival injection because in a congested eye it is less painful and avoids subconjunctival hemorrhage. Recently, its action as a synergist to another new drug—prostigmine—has been found to be most effective.

By retrobulbar and subconjunctival injection mecholyl is opposite in action to adrenalin; in that it lowers the blood pressure instead of raising it, causes miosis instead of mydriasis, and symptoms of parasympathetic stimulation instead of sympathetic stimulation. It causes a passing redness of the eye instead of a blanching. It is also dissimilar to adrenalin in that it causes great active hyperemia of the ocular blood vessels *immediately*, while the same effect, if it occurs at all, is delayed when adrenalin is used until the primary vasoconstriction has had time to pass off. For this reason and because mecholyl causes an almost immediate sharp fall in blood pressure, it produces a much more rapid and a much greater fall in the intraocular tension than does adrenalin and is strongly indicated in acute glaucoma, while adrenalin is usually definitely contraindicated here due to its causing mydriasis and elevation of general blood pressure.

Unfortunately, this condition of vascular dilatation cannot be expected to persist for long (over one-half hour) with injected mecholyl. Similar action can be

obtained by instilling the drug into the conjunctival sac, but in that case the action will naturally be much shorter in duration, and generally less effective than if the injection method were employed. However, once the pressure is lowered, the amount of drug action needed to maintain the lower level of pressure is much less than that required to bring about the initial drop. At this time, more dilute solutions of mecholyl or preferably of longer-acting miotics such as pilocarpine, prostigmine, or eserine are used to advantage and will usually hold the tension to normal thereafter if miotics alone are to be successful.

Once the pressure has been brought down, surgery can also be used to advantage. The actual surgical procedures will be greatly facilitated technically and there will be less danger of hemorrhage into the eye from the sudden lowering of pressure. This is perhaps one of the greatest values of mecholyl. It will bring down the tension in acute glaucoma so that surgery is more easily and more safely done, and when the general blood pressure and intraocular vascular blood pressure do rise, one-half to one hour later, the blood vessels are relatively constricted as the pressure rises. I have never seen any ill effects coming on at this time from hemorrhage.

Although mecholyl alone has a rather evanescent action, it may be used to advantage over long periods of time as a synergist of eserine, pilocarpine, or prostigmine.

No general symptoms of any kind have been noted following the instillation of mecholyl into the conjunctival sac. Locally, there is a dilatation of the conjunctival vessels lasting about 15 minutes. Following retrobulbar or intramuscular use, however, the following general symptoms and signs may appear, almost immediately:

1. Sweating These symptoms may be extremely severe
2. Salivation and dangerous, especially in old or hypertensive individuals, if extreme doses are given, but if 0.03 gm. is taken as a maximum dose for healthy adults, and 0.010 gm. as probably the minimal effective dose in elderly or emaciated patients, no severe reactions should occur.
3. Fall in blood pressure
4. Nausea
5. Skin feels hot
6. Slight dyspnea
7. Urinary urgency

It is of paramount importance that injection never be given unless atropine in a form suitable for injection is handy—preferably doses of 1/100 gr. This is usually simple as in an emergency the same needle and syringe can be used with 1-percent solution of atropine found in the office of every ophthalmologist as a source of antidote. When given intramuscularly, this will quickly abolish all systemic reaction. If atropine is not given the symptoms pass off in about 20 minutes.

In asthmatic or markedly allergic patients mecholyl injections should never be used because of the danger of sudden death from bronchiolar constriction and respiratory failure, which may be precipitated by the injection.

Case Reports

Case 1. H. A. had an immature cataract with acute exacerbation of glaucoma in the right eye, congestive in spite of 2-percent pilocarpine administered three times daily. Tension in the right eye was 100 plus mm. Hg (new Schiötz). Treatment consisted of 20-percent mecholyl drops given every 10 minutes for one hour, at the end of which time the tension had been reduced—to 14 mm. Hg—

and the pupil being in extreme miosis.

Case 2. J. Y. had chronic glaucoma in the left eye; trephining two years previously controlled the tension, with pilocarpine 1 percent in both eyes as a prophylactic. He now came in with a tension of 38 mm. Hg in the right eye, which in spite of pilocarpine and eserine every 10 minutes for six doses went up to 60 mm. in the right eye in a few hours. Mecholyl, 20 percent in drops, was administered every 10 minutes. In an hour the tension was 14 mm.

Case 3. R. G. had an acute first attack of congestive glaucoma in the right eye, with shallow anterior chamber, steamy cornea, and irregular dilated pupil. The tension in this eye was 92 mm. Hg. After seven doses of mecholyl (20 percent), and prostigmine (5 percent) drops the pupil became smaller, but the tension in the right eye was not reduced below 55 mm. A retrobulbar injection of 0.02 gm. was given and in three minutes the tension in this eye was 12 mm. and stayed there under miotics.

Case 4. A private patient of Dr. F. H. Verhoeff had a first attack of acute congestive glaucoma in the right eye, with steamy cornea, irregular pupil, and almost nonexistent anterior chamber, plus four congestion, tension 125 mm. Hg (new Schiötz). The left eye was white and quiet, but tension was 55 mm. The patient was 72 years old, obese, with a blood pressure of 250/130. After one hour of mecholyl (20 percent) and prostigmine (5 percent) administered every 10 minutes, the tension in the right eye was 50 mm., in the left eye 18 mm. Under the same therapy given every half hour the tension was reduced to 14 mm. in each eye within three hours, and the cornea was clear. The patient was put on mecholyl (20 percent) prostigmine (5 percent) every three hours over night. The next morning the tension in each eye

was 12 mm. She was sent home on pilocarpine (2 percent four times a day) and returned in three days with the right eye acutely congested, the tension up to 90 mm.; tension O.S. 20 mm. Hg (new Schiötz). Under similar mecholyl-prostigmine treatment for two hours the tension in each eye was 14 mm. (n.S.) and the eye whitened for surgery the next day.

PROSTIGMINE

This drug has a pharmacological action similar to that of eserine;¹¹ namely, that it inhibits the action of "A-C"-esterase. It differs from eserine in that it does not cause so much unpleasantness locally to the patient, has a stronger miotic action, and will not deteriorate so quickly as eserine. In addition it can be used in twice as strong concentration as eserine and causes less systemic reaction, such as nausea, when employed frequently as drops. The miosis it produces is usually greater than that caused by equivalent concentrations of pilocarpine and eserine, especially if used in conjunction with its most marked synergist—mecholyl.

Case Reports

Case 1. A. A. had chronic simple glaucoma in both eyes. Four days tension study in the Infirmary gave the following record:

Pilocarpine (4 percent, q.i.d.)

A.M.	Right eye 30	Left eye 36
		(complete blindness in this eye)
P.M.	24	28

Upon shifting to prostigmine (5 percent q.i.d.)

A.M.	Right eye 18	Left eye 26
P.M.	16	20

The patient was finally sent home and the tension was well controlled for four

months. She is now on prostigmine (3 percent) and mecholyl (10 percent), one drop of each four times a day.

Case 2. C. S. had had acute congestive glaucoma in each eye for seven days; worse in the right eye, with extreme chemosis of the conjunctiva, absent anterior chamber, steamy cornea, and dilated pupil.

The tension in the right eye was 77 mm. Hg, in the left eye 56 mm. (n.S.) After one hour's administration of mecholyl (20 percent) and prostigmine (5 percent), 1 drop of each given every 10 minutes, the tension was reduced to: right eye, 36 mm.; left eye, 20 mm.; and in a few hours both eyes had a tension of 20 mm. (n.S.)

Theoretically a maximum miosis or tendency toward producing miosis would be obtained by using:

1. Mecholyl to stimulate the sphincter muscle directly.
2. Prostigmine to inhibit esterase from destroying both the mecholyl and the normally produced acetylcholine.
3. Pilocarpine for its specific action on the sphincter muscle. One might even use ergotamine tartrate subcutaneously, in addition, to paralyze the sympathetic and allow the others an absolutely free rein.

Prostigmine, used alone or in conjunction with mecholyl drops, has shown great promise in the treatment of chronic glaucoma, although sufficient time has not elapsed to allow final conclusions to be made on this aspect of its use. It seems, at least, to be much less irritating than equally effective concentrations of eserine.

At the present time about 25 to 40 patients with chronic, simple glaucoma are being held under control with prostigmine and mecholyl drops. The results are very promising in that many of these patients who had not been so fortunate

under pilocarpine and eserine are having their glaucoma controlled with prostigmine combinations. For chronic use, to avoid unpleasant symptoms similar to those caused by eserine, it is occasionally necessary to use 10-percent mecholyl and 3-percent prostigmine, instead of the 20-percent mecholyl and 5-percent prostigmine used in acute cases.

A good routine treatment for a case of acute congestive glaucoma with

3. Continue the drops for another five doses.

When prostigmine is not available, 0.5-percent eserine may be used instead, for its physiological action is similar to that of prostigmine.

Mecholyl has been used most frequently by the retrobulbar method for acute glaucoma only, and very frequently has brought the tension to normal in from 2 to 20 minutes. Mecholyl injections were

TABLE 1
RESULTS OF MEC HOLYL AND PROSTIGMINE THERAPY OF GLAUCOMA

Type of Glaucoma	Total	Mecholyl (drops)			Mecholyl (retrobulbarly)			Mecholyl and Prostigmine (drops)			Mecholyl and Prostigmine and Pilocarpine		
		+	±	-	+	±	-	+	±	-	+	±	-
Acute congestive	32	2	0	1	14	4	2	8	0	1	0	0	0
Aphakia	10	1	1	0	5	1	0	1	1	0	0	0	0
Secondary, etc. (traumatic, discissions, blocked pupil)	14	1	0	0	3	3	1	3	3	0	0	0	0
Chronic simple	42	3	1	1	3	0	0	23	2	1	7	0	1
Buphthalmos	2	1	1	0	0	0	0	0	0	0	0	0	0
Total number treated	100	8	3	2	25	8	3	35	6	2	7	0	1

RESULTS OF ALL CASES TREATED IN THIS SERIES

Number of cases	+	±	-
100	75	17	8
Percent	75	17	8

Legend: + = cases brought to normal tension for minimum of two days, and usually either permanently or until put on other treatment. ± = cases brought to tension of 35 mm.Hg (new Schiötz) or under, long enough to permit a relatively safe surgical intervention. - = cases in which tension was not reduced below 40 mm. Hg (new Schiötz).

mecholyl and prostigmine might be outlined as follows:

1. Morphine gr. 0.25 subcutaneously if pain is marked.
2. Mecholyl 20-percent, prostigmine 5-percent, one drop a.a. given every 10 minutes for seven doses. If the tension has not approached normal after one-and-a-half hours, then inject retrobulbarly, preferably with a retrobulbar no.-25 needle and tuberculin syringe: 0.025 gm. of mecholyl in 1 c.c. of 2-percent procaine.

not used in any cases except those of acute glaucoma because, obviously, one cannot continue to inject any drug over a long period of time. Therefore, it was considered best to use some form of drug-instillation therapy in the chronic cases of glaucoma.

From relatively short experience, retrobulbar injection of mecholyl seems to be a most effective medical way of rapidly reducing high tension in acute glaucoma, whether it be primary or secondary in nature. This should find a wide field of

use in pre-operative glaucoma work, even when the tension is secondary to lens material in the anterior chamber following discission of congenital cataract.

Case. E. O'B., a 35-year-old female in good health, had been needled for congenital cartaract three days previously. She had been suffering from acute congestive glaucoma for 12 hours in spite of the intensive use of 2-percent adrenalin borate and atropine. A retrobulbar injection of 0.025 gm. mecholyl in procaine at the time of operation lowered the tension from 60 mm. Hg (new Schiötz) to 28 mm. in five minutes; at which time the keratome lowered it to almost 0 (new Schiötz) as a linear extraction was started. No complications from hemorrhage ensued.

CONCLUSIONS

1. In this short series, it is interesting to note that in six of the eight cases listed as failures there was subsequent trial of intensive anti-glaucomatous ther-

apy using other drugs. In no case was the status of the patient improved and in four cases it became definitely worse.

2. Of the 61 patients in this series under routine treatment with other anti-glaucomatous drugs when first seen, 41 were using pilocarpine, 10 were using pilocarpine and eserine, and 10 were using epinephrine compounds.

3. Twelve of these patients had previously had intensive pilocarpine and eserine treatment without success before being treated with mecholyl or prostigmine, and in 10 of these the tension was brought to normal.

4. Three patients had had intensive adrenalin-borate treatment before being seen, and two of these were brought to normal.

From the results presented, it would appear that mecholyl and prostigmine may prove of considerable value in the treatment of glaucoma, especially in the acute and subacute stages.

243 Charles Street.

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THE RETINA IN SEPTIC AND CHRONIC ENDOPHTHALMITIS OF ECTOGENOUS ORIGIN*

HARVEY D. LAMB, M.D.
Saint Louis

E. Fuchs¹ introduced the term septic endophthalmitis to designate the ocular condition characterized by the exudation of pus cells into the vitreous from the ciliary body and retina following the deposit of toxins in the vitreous. The designation purulent or septic uveitis is not fully applicable because the choroid is protected by the retina from the toxins in the vitreous and is only secondarily involved. In a recent paper, the present writer² reported that in each of 32 eyeballs with septic endophthalmitis of ectogenous origin, at least a few macrophages or exudative cells of chronic inflammation were intermingled with the pus cells in the vitreous. Twenty-four of these thirty-two eyeballs had small round-cell infiltration in the ciliary body and choroid; and the macrophages in the vitreous were generally quite numerous even in the first days of the inflammatory process. Corresponding with the density of the macrophages in the anterior part of the vitreous was the stage of formation of a cyclitic membrane. The condition in these 24 eyes was called complicated septic endophthalmitis.

It is the prevailing kind of phagocytic cell in the vitreous derived from the ciliary body and retina that determines the type of intraocular inflammation. If the microphages or pus cells predominate, septic endophthalmitis is present; if macrophages are rife, chronic endophthalmitis would seem the appropriate diagnosis. The essential factor in chronic endophthalmitis is exactly the same as that

in septic endophthalmitis; namely, the presence of toxins in the vitreous chamber. Whether the inflammatory process is acute, mixed, or chronic depends upon its intensity from high to low, as pointed out by J. Lossen.³ The intensity of the inflammation must vary with the virulence and number of the bacteria present versus the resistance of the infected tissue. Bacteria deposited in the vitreous chamber are, of course, opposed with considerable difficulty since the vitreous contains no blood vessels. Anatomic examination of the eyes with septic endophthalmitis has shown that in an overwhelming majority, a considerable degree of chronic endophthalmitis was present together with the acute or septic process. It is actually, then, a mixed acute and chronic process.

In the previous paper, the relative number of pus cells and macrophages in the posterior or retinal portion of the vitreous were included in a table for each of the 24 eyes with complicated septic endophthalmitis. Although these phagocytic cells in the posterior vitreous were entirely derived from the retina, nothing was reported as to conditions in the retina itself.

In the present paper, there will be tabulated the relative number of pus cells and macrophages coming from the anterior and posterior halves of the retina, the degree of round-cell infiltration in the anterior and posterior halves of the retina (always confined to the inner layers of the retina), the amount of perivascularitis, and whether a connective-tissue membrane on the inner surface of the retina is in process of formation. By the term round cells is meant the macrophages, small lymphocytes, and plasma cells.

*From the Department of Ophthalmology, and the Oscar Johnson Institute, Washington University School of Medicine.

SEPTIC ENDOPHTHALMITIS

There is not included in this study cases of simple septic endophthalmitis since the findings in the retina in this condition are quite uniform. The endophthalmitis in these eyes is in an acute or fulminant stage. The irritant deposited in the vitreous in these cases is so virulent as to cause emigration of almost entirely pus cells from the retina. No perivascularitis of round cells can therefore be present. The number of pus cells from the anterior half of the retina is always much less than from the posterior half because of the richer blood supply to the latter. A dense mass of pus cells frequently observed lying internal to the anterior end of the retina in simple septic endophthalmitis has its source in the adjacent ciliary body where the blood supply is obviously excellent. It is not uncommon in this condition to have the retina entirely destroyed by the virulent toxins in the vitreous.

In the present table, there are included eyes with complicated septic endophthalmitis, now 28 in number, out of 36 eyes of simple and complicated septic endophthalmitis. Only cases of ectogenous origin are used, although those with an endogenous source present exactly the same cytologic changes, as pointed out by E. Fuchs. However, in the latter, a definite time for the start of the inflammation cannot be determined. The principal characteristics of complicated septic or mixed endophthalmitis, as far as the vitreous is concerned, are large numbers of pus cells, at least in its anterior portion or where it is surrounded by the ciliary body, together with numerous macrophages in the same place. In other words, a considerable intensity of the inflammatory process leads to the production of many macrophages. Since macrophages can change to fibroblasts (Lamb⁴) and lead to the formation of a cyclitic membrane along the inner surface of the ciliary body, eyes

with complicated septic endophthalmitis are prone to show the development of connective-tissue membranes on the inner free surface of the ciliary body.

In the table, the eyes are arranged according to the length of the interval from the time of the penetration of the globe to the date of enucleation. As reported in the former paper, the macrophages or exudative cells of chronic inflammation appear almost at once (two days here) in the vitreous internal to the retina. This simultaneous appearance of significant numbers of macrophages with the pus cells must be due to the weakening of the toxins from the vitreous as they penetrate more deeply into the inner layers of the retina. Where the toxins are still virulent or strong, they cause the emigration of pus cells from the retinal blood vessels. As the toxins become weakened by the tissue fluids, they tend to stimulate the production of macrophages. The continuous weakening of the toxins in the vitreous from the defensive bodies in the fluid exudate coming into the vitreous from the ciliary body and retina should influence the inflammatory process to become gradually more chronic or to show proportionally more macrophages in the vitreous. From a study of the table of the eyes with septic endophthalmitis, where in the last eye the inflammation is four months old, it is seen that the general tendency is but slightly toward chronicity. This finding would appear to emphasize the very meager defensive qualities of the vitreous, even after several months' duration of the inflammation.

A study of the number of emigrating cells from the retina into the vitreous shows in the case of both the pus cells and macrophages that they are generally more numerous from the posterior half of the retina where the blood supply is greater. That the latter finding is not entirely uniform must be partly due to the

2344	particle steel in vitreous	3½ weeks	few	few	few	few	few	moderate	moderate	moderate	none
1021	corneal wd. from nail	4½ weeks	moderate	few	moderate	moderate	moderate	moderate	moderate	moderate	incipient
2253	corneal wd., piece steel	4½ weeks	few	many	few	many	few	few	few	none	incipient
1041	wd. at limbus from glass	5 weeks	moderate	few	moderate	moderate	moderate	moderate	moderate	mild	none
1374	corneal wd., piece steel	5 weeks	none	few	none	few	none	few	few	mild	none
1970	corneal wd., piece steel	5 weeks	moderate	few	moderate	few	moderate	moderate	few	moderate	none
250	corneal wd., end of wire	6 weeks	few	moderate	moderate	few	few	few	few	intense	none
482	iridectomy for glaucoma	6 weeks	few	few	moderate	many	moderate	moderate	moderate	mild	incipient
2358	corneal wd. from nail	2 months	few	moderate	few	moderate	few	few	few	mild	none
1899	perforating corneal ulcer	3½ months	few	moderate	none	moderate	none	moderate	moderate	moderate	none
1132	wd. at limbus from shot	4 months	none	none	moderate	moderate	moderate	moderate	moderate	intense	incipient
1275	wd. at limbus from glass	4 months	few	many	moderate	many	moderate	moderate	many	moderate	none

CASES OF CHRONIC ENDOPHTHALMITIS

1510	corneal wd. from wood	12 days	none	none	few	few	few	few	slight	none
2059	corneal wd. from rock	6 weeks	none	none	none	none	few	few	mild	none
1906	corneal wd. from glass	8 weeks	none	none	few	few	few	few	mild	none
866	particle steel in vitreous	2¼ months	none	none	none	none	none	none	none	none
1952	trephine operation	3 months	none	none	few	few	few	few	moderate	none
2304	trephine operation	3 months	none	none	few	moderate	moderate	moderate	mild	none
1349	iridectomy for glaucoma	5 months	none	none	none	few	none	none	none	none

varying depths of penetration of the etiologic agent.

Pus and red blood cells emigrating from the retina in septic endophthalmitis may detach the vitreous (fig. 1) and come to lie between the unbroken internal limit-

Varying fairly closely with the number of macrophages coming from the anterior and posterior halves of the retina are the relative amounts of round or chronic inflammatory cells infiltrating or lying within these parts of the retina.



Fig. 1 (Lamb). Case 2218. Section through part of eye with septic endophthalmitis, showing pus and red blood cells from retina producing a detachment of the vitreous.



Fig. 2 (Lamb). Case 1132. Section through part of eye with septic endophthalmitis, showing foreign-body giant cells formed from macrophages on the inner surface of the retina.

ing membrane of the retina and the intact hyaloid membrane.

Just as in the case of the anterior or cyclitic portion of the vitreous, the pus cells with their greater activity generally move farther into the vitreous while the macrophages as a rule remain near the inner surface of the retina. On account of the latter, the retinal membrane developed from the macrophages in the vitreous lies close to the retina. The effect of the toxin in the vitreous may exceptionally lead to the formation from the macrophages of foreign-body giant cells on the inner surface of the retina (fig. 2).

Since all the inflammatory cells infiltrating and coming from the retina must arise within or around the retinal blood vessels, the perivasculitis is by far the most significant feature of the reaction of the retina to toxins in the vitreous. Perivasculitis, in at least a mild degree, was present in all but 2 of the 28 eyes with complicated septic endophthalmitis. A moderate intensity of perivasculitis was present in 8 eyes and an intensive degree in 2 eyes of this series. In eyes in which the inflammatory process was not more than two weeks old, but in a majority of the longer-inflamed eyes also,

only macrophages form the infiltrating cells of the perivasculitis and of the adjacent inner layers of the retina (figs. 3 and 4). Within the lumina of the affected blood vessels, monocytes are commonly observed together with pus cells. Maxi-

eyes, small lymphocytes and plasma cells together with macrophages infiltrated the inner layers of the retina adjacent to the blood vessels that presented perivasculitis. The small lymphocyte in the retina can only come from the blood. It is gen-

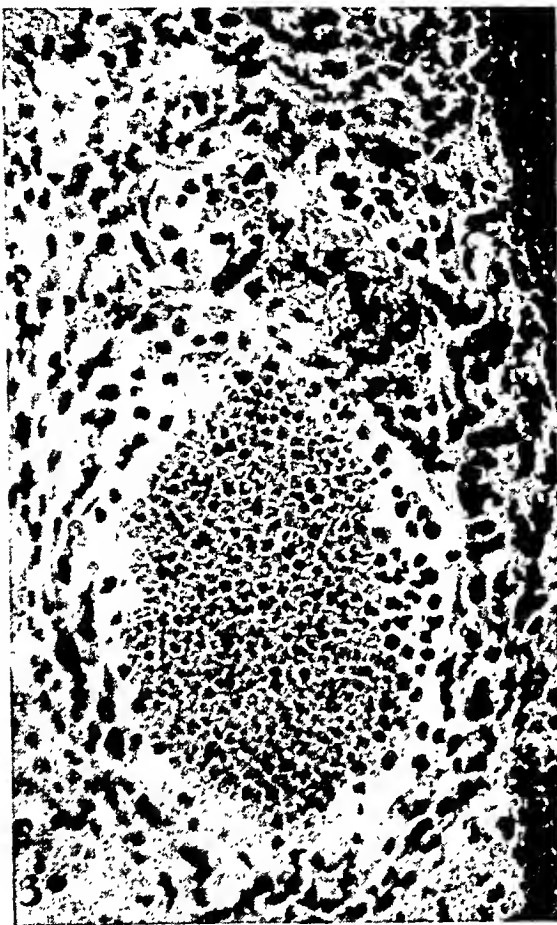


Fig. 3 (Lamb). Case 2119. Section through part of eye with septic endophthalmitis showing retinal perivasculitis composed of macrophages. At the periphery of the bloodstream on the right, there occur numerous monocytes.

Fig. 4 (Lamb). Case 1899. Section through part of eye with septic endophthalmitis showing retinal perivasculitis composed of macrophages and numerous monocytes within the bloodstream. To the right on the inner surface of the retina, macrophages from the retina are elongating into fibroblasts.

mow⁵ derives the macrophages of inflamed tissue much more commonly from the lymphocytes and monocytes of the blood than from the local histiocytes situated around the blood capillaries. Among the present series, in seven eyes, small lymphocytes and plasma cells participated in the perivasculitis. In all seven eyes, the inflammation had been present for two weeks and more. In the case of these seven

erally agreed that the plasma cell is derived from the small lymphocyte.

Keller⁶ reported two cases with retinal perivasculitis in septic endophthalmitis. In the first case, the eye was removed four weeks after a perforating injury through the cornea and adjacent sclera. A moderate degree of septic endophthalmitis had caused an exudation of pus cells from the anterior portion of the

retina. Posteriorly, there was present no exudate of pus cells from the retina but an intensive degree of perivasculitis. In the second case, through the use of intramuscular milk injections, the vitreous became sufficiently clear to obtain the very unusual ophthalmoscopic picture of retinal perivasculitis. Posteriorly, along the veins only, there occurred 16 well-disseminated, small, white, fairly well-circumscribed spots. In the following few days with the healing of the eye, these spots entirely disappeared. This valuable contribution emphasized the overwhelming involvement of the retinal veins over the arteries and the focal arrangement of retinal perivasculitis.

CHRONIC ENDOPTHALMITIS

For comparison with the eyes having septic endophthalmitis, seven eyes with chronic endophthalmitis are included in the table. The difference in the retinal findings of the eyes with chronic endophthalmitis as compared with those having septic endophthalmitis is striking in respect to the intensity of the inflammatory process. The retinal macrophages were generally much less numerous in chronic endophthalmitis than in septic endophthalmitis. The retinal perivasculitis was not so intensive, causing less infiltration of round cells in the retina and fewer macrophages in the vitreous. Small lymphocytes are only occasionally observed among the perivascular macrophages and in the retinal infiltration of chronic endophthalmitis. Nevertheless there were enough inflammatory changes in the retina of these eyes with chronic endophthalmitis to demonstrate that the essential etiologic factor (the presence of toxins in the vitreous) is the same as in septic endophthalmitis. This fact was clearly confirmed beyond any dispute in all seven eyes by the presence of numerous macrophages on the inner surface of

the ciliary body. The much better blood supply in the ciliary body as compared with that in the retina would explain the greater number of macrophages emigrating from the ciliary body through chemotactic action of the toxins in the vitreous. The choroid presented very little cellular infiltration in these eyes with chronic endophthalmitis with the exception of case 2304. Here the choroid was a little thickened by dense infiltration with small lymphocytes and plasma cells occupying its external layers. In the writer's recent article² similar infiltrations of the choroid were reported as occurring in septic endophthalmitis and being due to toxins in the vitreous. In case 2304, the retina was considerably degenerated and therefore more porous to toxins in the vitreous.

It is true that in the tabulation, eyes with chronic endophthalmitis are greatly outnumbered by those with septic endophthalmitis. Nevertheless there are sufficient cases to demonstrate clearly that, as a rule, in chronic endophthalmitis, the macrophages or exudative cells of chronic inflammation are considerably less numerous than in septic endophthalmitis. In the latter, a much greater intensity of the inflammatory process prevails than in chronic endophthalmitis.

As regards the spontaneous formation of connective tissue on the inner surface of the retina or retinitis proliferans, Leber⁷ wrote in considerable detail. After serious injuries to the eye, this formation of connective tissue occurred in the midst of red blood cells, rarely in the presence of inflammatory exudate on the inner surface of the retina. This new formation of connective tissue was known as organization. With other observers, Leber considered the essential process to be combined with a hyperplasia of the supporting structure of the retina. In our series, the formation of connective tissue

on the inner surface of the retina was noted in six eyes with septic endophthalmitis and in none of the seven with chronic endophthalmitis. As illustrated in figure 5, it can be seen that fibroblasts develop from macrophages to form this

hyperplasia of the neuroglia cells or supporting structure of the retina always occurs to some degree in every degenerated retina. Secondary degeneration of the retina invariably accompanies any serious case of endophthalmitis. If the connective

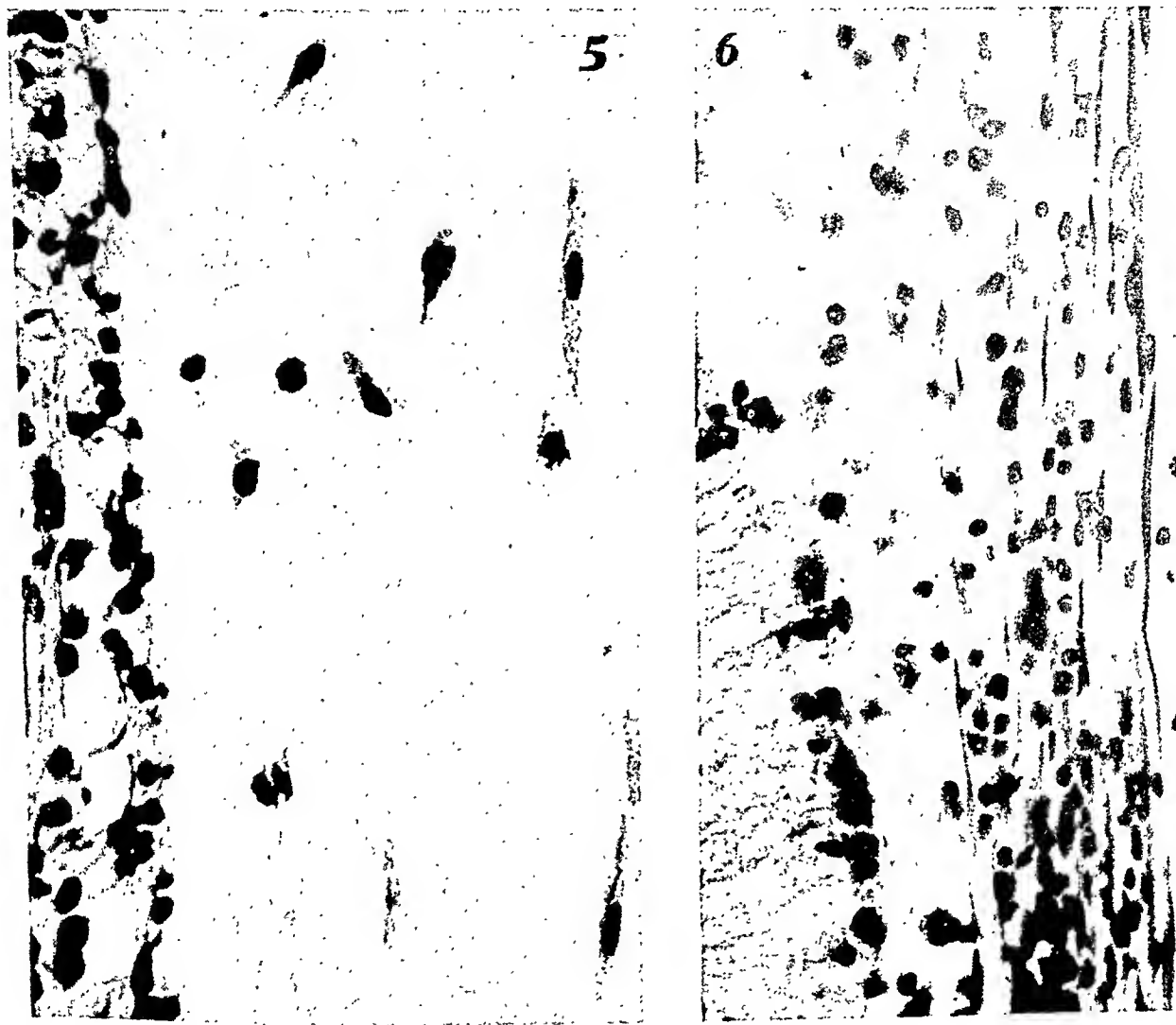


Fig. 5 (Lamb). Case 1899. Section through part of eye with septic endophthalmitis showing macrophages coming from the retina on the left, in the process of developing into fibroblasts.

Fig. 6 (Lamb). Case 1132. Section through part of eye with septic endophthalmitis showing on the right an incipient connective-tissue membrane formed from and infiltrated with retinal macrophages.

connective tissue on the inner surface of the retina just as in the case of the cyclitic membrane (Lamb⁴). In figure 6, a thin layer of connective tissue produced from retinal macrophages is presented. This is all that organization of a hemorrhage or of an inflammatory exudate within the vitreous can ever mean. The

tissue developed on the inner surface of the retina is a neuroglial structure, it will not stain red with the acid-fuchsin of Van Gieson's stain, as it does. This layer of connective tissue is appropriately termed a retinal membrane.

As to the rapidity with which this connective tissue forms it is noted in the table

for case 999 that fibroblasts on the inner surface of the retina were developing from macrophages seven days after the start of the inflammation. In addition, two weeks after the etiologic penetration in case 1330, connective tissue in this situation was beginning to be produced by fibroblasts, derived from macrophages. Of course, contraction of this new-formed connective tissue sooner or later leads to retinal detachment, but since the eyes in these cases were already destroyed by irreparable injury to the ciliary body (Lamb²), the sequelae of cyclitic or retinal membranes were not of much clinical importance.

SUMMARY

The principal retinal changes are tabulated in the case of 28 eyes with septic endophthalmitis and of seven eyes with chronic endophthalmitis. The 28 eyes with so-called complicated septic endophthalmitis were characterized by at least a small amount of small round-cell infiltration in the ciliary body and choroid together with the exudate of numerous pus cells and macrophages into mainly the anterior or the cyclitic portion of the vitreous. The term chronic endophthalmitis is introduced as a corollary to septic endophthalmitis for the clinical and pathologic diagnosis of eyes showing an exudate into the vitreous that is composed

almost altogether of macrophages. The retinal change occurring first in endophthalmitis was perivascularitis. The latter was the source of all the inflammatory round cells that infiltrated the retina and migrated into the vitreous from the retina. In all the eyes tabulated, the macrophage was the predominant cell composing the perivascularitis. Perivascularitis in some degree was present in all but two of the 28 eyes with septic endophthalmitis and in all but two of the seven eyes with chronic endophthalmitis. The number of round cells infiltrating the retina and the number of macrophages from the retina entering the vitreous were generally fewer by far in chronic endophthalmitis than in complicated septic endophthalmitis. The retinal membrane on the inner surface of the retina like the cyclitic membrane was composed of connective tissue produced by fibroblasts that developed from the macrophages in the vitreous. This retinal membrane is more likely to occur in septic endophthalmitis than in chronic endophthalmitis because more macrophages develop in the former.

All the sections of eyeballs and photomicrographs used in this study were prepared in the Laboratory for Ophthalmic Pathology, Washington University School of Medicine.

827 Metropolitan Building.

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OCCUPATION IN RELATION TO CANCER OF THE EYE AND ADNEXA*

WITH PRACTICAL POINTS FOR THE OPHTHALMOLOGIST

LAURA A. LANE, M.D., F.A.C.S.

Ann Arbor, Michigan

The medical literature of Great Britain, France, Germany, and, to a lesser extent, that of America contains articles dealing with occupational cancer. No specific articles on cancer of the eye and adnexa have been found. Kenneway,¹ in an article concerning the anatomical distribution of occupational cancer, found 11 cases of eye and eyelid epitheliomas among 100 pitch workers, and 2 cases among 33 tar workers. Among 38 persons who had 75 cancers due to arsenic only one case in which the eyelid was involved was found.

Among 21,510 patients suffering with neoplastic disease, seeking treatment at Memorial Hospital, New York City, during a period of 13 years, Haagensen² found 208 cases of ocular cancer (not all were verified by biopsy).

At the 1936 meeting of the American College of Surgeons the writer presented a report³ on an occupational study of cancer of the eye, setting forth the results in 1,000 patients. The cases were equally divided between carcinomas and malignant melanomas.

SOURCES OF MATERIAL

The material used in this study was obtained from the following sources:

- (1) From the records of 22 eye clinics in different parts of the United States and Canada.
- (2) From the records of four institutions devoted exclusively to the

study and treatment of cancer.

- (3) From the private records of many eminent ophthalmologists.
- (4) From medical services of large industrial plants producing chemicals, oils, carbon products, and gas.

Every case studied has been verified by biopsy or microscopic section of the tumor.

CLASSIFICATION OF OCCUPATIONS

More than 154 different occupations were represented in this collection of ocular tumors. There was some difficulty in condensing and grouping such a large number. The following classification was made:

Group I. Occupational groups exposed to oils and lubricants.

Group II. Occupational groups exposed to sunlight.

- (1) Occupations with considerable exposure to sunlight and the elements.
- (2) Occupations with exposure to sunlight and tar (Group IV, 2).
- (3) Occupations with exposure to sunlight, chemicals, and irritants.

Group III. Occupational groups exposed to chemicals.

Group IV. Occupational groups exposed to (1) coal, (2) pitch and tar.

Group V. Occupational groups exposed to radioactive substances as radium and roentgen ray.

Group VI. A large group of miscellaneous occupations such as: Clerical, domestic and personal, construction, engineering, professional, manufacturing, transportation, and trades—affecting

*From the Department of Ophthalmology of the University of Michigan. Read before the Eye, Ear, Nose, and Throat Section of the Tarrant County Medical Society, Fort Worth, Texas, March 4, 1938.

business men, merchants, salesmen, and others.

Group VII. A comparatively small group of workers in metals.

LACK OF OFFICIAL OCCUPATIONAL CANCER STATISTICS

Official occupational-mortality statistics, tables of age distribution in occupations, and cancer-morbidity rates, except those in a few states and the data of the Metropolitan Life Insurance Company are not available in this country. Britten⁴ in 1934 made an occupational-mortality cancer report. It concerned men only and covered 10 states. The data were derived from the 1930 United States census material.

Hundreds of records in eye clinics and in ophthalmologists' offices failed to record the occupation of patients, and this is a very important item in a cancer history. In general cancer work it is now recognized that an increased cancer incidence exists in those occupations involving chronic irritation and prolonged exposure to aniline, anthracene, arsenic, creosote, paraffin, petrolatum, pitch and tar, radium and roentgen ray, shale oil, and soot.

GROUPING OF THE CASES BY NEOPLASMS

The eye records chosen for this study were grouped under the two principal malignant-tumor classifications; namely, malignant melanomas (sarcomas), or the connective-tissue type, and the carcinomas, or epithelial-cell type.

There were 500 cases equally distributed in each classification. Other malignant tumors involving the eye and adnexa are very rare and are of no great importance in an occupational study. Retinoblastomas occur before the eighth year of age, as a rule, and do not present an occupational problem.

It will at once be seen that there is a

TABLE 1
OCCUPATIONAL GROUP I EXPOSED TO OILS AND LUBRICANTS

Carcinomas		Sarcomas	
Occupation	Cases	Occupation	Cases
Automotive occupations	6	Automotive occupations	9
Machinist, mechanic	6	Machinist, mechanic	6
Mechanical engineer	1		
Oil-station attendant	2	Oil-lubricant handler	1
Plumber, steamfitter	2		
Printer	1	Printer	3
Total	18	Total	19
Total of all cases of both types		37	

striking similarity in the occupations, also in the number of cases of each type of cancer in Group I. A total of 37 cases per 1,000 is high. It indicates an increased cancer distribution among those whose occupations exposed them to oils and lubricants (table 1). The general cancer rate is 8 for females and 11 for males per 1,000.

Oils produced in the United States except in the Middle West oil region where oils have a higher paraffin and asphalt base, do not have such high carcinogenic properties as do foreign oils. American oils contain less sulphur than do foreign oils. Refining in the United States is largely a closed process; the workmen have little contact with the oil. One of the largest oil companies, employing thousands of workers, with records extending over many years, shows a surprisingly small number of cases of cancer of all parts of the body.

Group II may be called the solar group, and it was found desirable to divide it into three subdivisions, as follows: (1) A larger group, composed of semiskilled and unskilled workers, whose occupations exposed them much to sunlight and the elements. (2) A smaller group whose occupations relate to the sea, exposure to sunlight, and to a known carcinogenic agent; namely, pitch and tar of Group

TABLE 2

OCCUPATIONAL GROUP II EXPOSED
TO SUNLIGHT1. *A group with considerable exposure to sunlight
and the elements*

Carcinomas		Sarcomas	
Occupation	Cases	Occupation	Cases
Engineer, Civil	5		
Farmer (54), Gar- dener (2)	56	Farmer	23
Governess	1		
Laborer	42	Laborer	14
Mail carrier	3	Mail carrier	2
Peddler	2	Peddler	1
Soldier	2	Soldier	3
		Forest-fire fighter	1
Total	111	Total	44

2. *A group with exposure to sunlight, the ele-
ments, and to pitch and tar*

Carcinomas		Sarcomas	
Occupation	Cases	Occupation	Cases
Fisherman	2	Fisherman	2
Diver	1		
Dock worker	1		
Sailors—Seaman, Marine and Navy Officers	6		
Total	10	Total	2

3. *A group exposed to sunlight, trauma, and chem-
icals*

Carcinomas		Sarcomas	
Occupation	Cases	Occupation	Cases
Bricklayer, cement worker, and stone mason	3	Bricklayer	2
Carpenter	11	Carpenter	10
Painter	4	Painter	7
Total	18	Total	19

SUMMARY OF DIVISIONS 1, 2, AND 3, GROUP II

	Carcinomas	Sarcomas
Division I		
Cases	111	44
Division II		
Cases	10	2
Division III		
Cases	18	19
Total	139	65
Grand Total of Carcinomas and Sarcomas		204

IV. (3) A third division of only three occupations, skilled in character, where workers are exposed not only to sunlight but also to chemicals and trauma.

Group II has more than 2.8 times (the exact number is 204) the total number of cases found in all the other groups except Group VI, the miscellaneous group.

In Division 1 attention is called to the large number of farmers and laborers having carcinomas, 98 in number. Others in this country and abroad have noted the same thing.^{5, 6}

As to Division 3 of Group II, English writers have called attention to the large number of carpenters having neoplasms. Many attribute this to trauma. Our study of ocular cancer does not bear this out. Only one patient in our series gave a history of trauma. We believe the occupational hazard is due to the handling of creosoted shingles, of composition roofing which contains much tar and asphalt, and of building papers, also other lining products many of which are chemically treated. Carpenters are exposed to fine particles of these products in addition to sunlight. Seven carpenters had a basal-cell tumor of the eyelid. Four had a squamous-type tumor. More than half of these men were in the sixth and seventh decades of life and the remainder were between 47 and 52 years of age. Of the malignant melanomas in carpenters, seven tumors were in the choroid, one in the iris, and two in the conjunctiva.

Painters have a potentially increased distribution of ocular cancer. Chrome is a decided chemical irritant and frequently enters into the composition of paints.

A very small distribution of ocular cancer was found among those whose occupations involved a considerable use of chemicals. Some 40 operations, mostly chemical, are used in the process of tanning and preparing leather. Only one leather tanner was found. This patient

TABLE 3
OCCUPATIONAL GROUP III EXPOSED
TO CHEMICALS

Carcinomas		Sarcomas	
Occupation	Cases	Occupation	Cases
Dye worker	1	Chemist	1
Ice manufacturer	1		
Ink manufacturer	1		
Sulphur worker	1	Leather worker tanner	1
Total	4	Total	2

had a melanosarcoma of the choroid which had no possible connection with his occupation.

Arsenic is a chemical which frequently produces malignancies of the skin. This study has not disclosed an ocular neoplasm among arsenic workers or arsenic users.

Our survey material has drawn heavily upon territories adjacent to the three large coal-industry areas of Pennsylvania, West Virginia, and Southern Illinois. The records of eight institutions receiving patients from these coal areas yielded histories of only five coal miners with a cancer of the eye. The literature does not indicate an increase of cancer among coal miners and our data corroborate this.

Concentrated coal products such as pitch and tar derived by distillation of coal are potent carcinogenic agents. Gas-house workers show a rather high cancer incidence in other parts of the body but not in the eye.

TABLE 4
OCCUPATIONAL GROUP IV EXPOSED TO
(A) COAL, (B) PITCH AND TAR

Carcinomas		Sarcomas	
Occupation	Cases	Occupation	Cases
Coal miner	4	Coal miner	1
Fireman, stationary (A)	1		
Official—Coal company	1		
Stone paver (B)	2		
Total	8	Total	1

A definite occupational hazard in the handling and use of radioactive substances has been known for years. Many of the lesions are of a squamous-cell-carcinoma type.

Four eye cases were collected. Three of these had other cancer lesions than those of the eye. One of the nurses had been treated years before for a lupus which involved the cheeks. Protection had not been given to the eyes. She had a squamous-cell lesion of the lower lid. The other nurse had been a handler of radium for many years and developed a lymphatic leukemia with eye lesions. One of the

TABLE 5
OCCUPATIONAL GROUP V EXPOSED TO
RADIOACTIVE SUBSTANCES, RADIUM AND
ROENTGEN RAY

Carcinomas		Sarcomas	
Occupation	Cases	Occupation	Cases
Nurse	1	Nurse	1
Physician	2		
Total	3	Total	1

physicians had a basal-cell type of carcinoma involving the face, eyelid, and forearm.

On record are now some 150 cases of carcinomatous lesions developing in different parts of the body in workers long exposed to radioactive agents such as roentgen rays⁷ and a smaller occupational group of radium workers who have developed osteogenic sarcomas and lymphatic leukemia. The radioactive occupational hazard to the eye does not appear to be very great.

Nearly three fourths of the 1,000 cases fall in Group VI. The occupations in this group are of a more or less sedentary nature. Most of them are indoor occupations without much exposure to sunlight or to known cancer irritants. Many semi-skilled and unskilled occupations as well

as highly skilled occupations are included in this group.

TABLE 6
MISCELLANEOUS GROUP VI CONDENSED
DISTRIBUTION OF 50 DIFFERENT
OCCUPATIONS

Carcinomas	
Occupation	Cases
Clerical occupations	4
Domestic and personal service, housewives (165)	183
Manufacturing and mechanical	11
Occupation none, retired, aged	43
Professions: clergy (9), lawyers (2), teachers (7)	18
Public service	5
Students (8), child (1)	9
Transportation	5
Trades: business men (4), merchants (4), salesmen (7)	20
Unemployed	20
Total	318

Sarcomas	
Occupation	Cases
Clerical occupations	12
Domestic and personal service, housewives (181)	194
Manufacturing, mechanical	21
Occupation, none, retired, aged	77
Professions: clergy (3), lawyers (2), nurses (1), physicians (4), teachers (3), others (3)	16
Public service	4
Students (22), child (17)	39
Transportation	5
Trades: businessmen (9), merchants (12), salesmen (15)	36
Unemployed	3
Total	407
Grand Total	725

as "occupation none, retired and aged," there is a large predominance of malignant melanomas. The professions, public service, and transportation groups have nearly the same number of cases in each type of neoplasms.

The unemployed show almost seven times more carcinoma than sarcoma cases. This is accounted for by the much older age incidence of the carcinoma patients.

TABLE 7
OCCUPATIONAL GROUP VII ENGAGED IN
METAL INDUSTRIES

Carcinomas		Sarcomas	
Occupation	Cases	Occupation	Cases
Aluminum worker	1		
Brass turner	1		
Dye engraver	1		
Foundryman—moulder	2		
Grinder polisher	1	Gov't mint inspector	1
Iron worker	3	Grinder polisher	1
		Iron worker	1
		Sheet metal worker	2
		Tin worker	1
Total	9	Total	6

This occupational group is not large. There is an increased distribution of cancer of the eye for the group as a whole. Most of the metal industries use one or more chemicals in connection with the manufacture of their products. In certain divisions of the iron industry sulphuric acid is used for bleaching in making gray iron castings. Workers are exposed to frequent splashes. Some of the patients gave a long history of exposure in their work. The tin worker had been employed by the same firm for 20 years.

As a rule it takes from 10 to 15 years' exposure to an irritant before precancerous or cancerous lesions develop.

REVIEW OF THE GROUPS

Table 8 shows four groups which have an increased distribution of cancer of the eye. However, not all the occupations in these groups show an increased distribu-

Table 6 shows 89 more cases of malignant melanomas (sarcoma) than carcinomas. The clerical occupations have three times as many cases. The domestic and personal-service occupations show 11 more melanomas. The manufacturing and mechanical industries have doubled the number of melanomas lacking one case. In the student and child group there are over four times as many cases as in the carcinoma group. There are nearly twice as many in the trades as in a similar carcinoma group. In the group designated

TABLE 8
SUMMARY OF ALL CASES IN ALL GROUPS

	Carcinoma Cases	Sarcoma Cases	Total cases carcinoma, sarcomas	Percentage per 1000 Cases
Group I—Exposed to oils	18	19	37	3.7
Group II—Exposed to sunlight Divisions 1, 2, and 3	159	65	204	20.4
Group III—Exposed to chemicals	4	2	6	0.6
Group IV—Exposed to coal, tar, and pitch	8	1	9	0.9
Group V—Exposed to radioactive substances	4	0	4	0.4
Group VI—Miscellaneous occupations	318	407	725	72.5
Group VII—Exposed to metals	9	6	15	1.5
Totals	500	500	1000	100.0

tion above that found in the average general cancer rate per 1,000 cases. Occupations in which workers are exposed to oils and having relation to the automotive field show some increased distribution. Printers, plumbers, and steam fitters, who use oils more or less in their work, do not show any such increase. Group II, comprising occupations wherein workers are exposed to sunlight, the elements, pitch and tar, and chemicals, shows a large distribution. Especially to be noted is the large number of farmers and of laborers who form 85 percent of the 155 cases in this group.

In the large miscellaneous group whose workers have more or less sedentary occupations which present no great occupational hazards, there is a rather startling increase, particularly in the domestic and personal-service occupations, more than one third of the entire 1,000 cases being in housewives. Individually the clerical occupations show no increase, but taken as a group they do. Likewise, the manufacturing and mechanical industries as a group show considerable increase. Group VII is a small select group of skilled artisans, mostly the male sex, with no individual increase in cancer of the eye, but the group as a whole shows a slight increase. Another point of interest to the ophthalmologist is the anatomical distribution of the eye lesions, as well as the age and sex distribution.

The anatomical-distribution chart shows that carcinomatous lesions are confined largely to the adnexa and to those parts most exposed to occupational irritants and traumas. A very different picture of the number and of the anatomical distribution of the sarcomatous lesions is seen (table 9).

The average age of the 500 patients having ocular carcinoma was 57.15 years. The average age of those with a similar number of malignant melanomas (sarcoma) was 48.5 years. There were 201 females among the 500 carcinoma cases and 214 among the 500 sarcomas, making a total of 415 in both types of cancer. Of the males we find 299 among the 500 carcinomas and 286 among the 500 malig-

TABLE 9
ANATOMICAL DISTRIBUTION OF CANCER
OF THE EYE

Carcinomas		Sarcomas	
Lower lid	149	Lower lid	5
Upper lid	52	Upper lid	5
Inner canthus	90	Inner canthus	2
Outer canthus	32	Outer canthus	1
Other locations about lids	89	Other locations about lids	1
Conjunctiva	46	Conjunctiva	37
Orbit	42	Orbit—primary	50
		Lacrimal	3
		Uvea	
		Choroid	360
		Ciliary body	13
		Iris	23
Total	500	Total	500

nant melanoma cases, or a total of 585 in the 1,000.

It will be seen that there is an excess of 170 males over females; however, five of the seven occupational groups had occupations in which, as a rule, only men are engaged. Much of our material was drawn from large industrial centers, which may possibly account for the predominance in men.

Data on heredity was too incomplete to be of any value, as was also information on the duration of symptoms before treatment was started.

This study brought out the fact that the number of cases of cancer of the eye over a period of 7 to 30 years in many of the clinics shows no increase. The number of cases in each type runs constant. The only rise was in the number of sarcoma cases immediately following influenza epidemics.

The following points should be given attention by ophthalmologists when taking cancer-of-the-eye histories. It is exceedingly important to know how long a patient has followed his occupation. Likewise, whether any other occupation was followed previous to the present occupa-

tion and if so, how long that occupation was pursued. These questions often have an important medico-legal bearing. Instances are found in the literature and in this survey material in which a patient suffering with a cancer had changed his occupation. This change in occupation had for a time led to a decrease in the growth. Such a patient should be classified under the primary occupation and is not entitled to compensation.

The exact nature of the duties of the occupation should be noted. Is the patient working more or less constantly with known cancer irritants? A plea is made that every person who takes a cancer history of the eye get a complete and full history of the patient. Details are of importance in solving the cancer problem. Good follow-up records are of great importance in cancer work. Eye clinics, unfortunately almost without exception, have not been in the habit of following up their tumor cases. In the institutions for the study and treatment of malignant disease, the records are far better, and good follow-up work has been going on in many of them for more than five years.

1007 Forest Avenue.

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CONTRAST SENSITIVITY AS A CRITERION OF VISUAL EFFICIENCY AT LOW BRIGHTNESS-LEVELS*

MATTHEW LUCKIESH, D.Sc. AND FRANK K. MOSS
Cleveland, Ohio

It is generally conceded by ophthalmologists that visual acuity is the most important ocular requirement for the licensure of automobile drivers, and proposed visual standards are usually based upon this criterion.¹ This conclusion involves the assumption that the determination of visual acuity with test objects of maximal contrast under photopic conditions is appropriate and adequate for the purpose of driver-testing. However, under low brightness-levels, such as exist on streets and highways at night, most hazards are large in size and of relatively low contrast. Therefore, it is interesting to study the individual variations in contrast threshold among motor-vehicle drivers and others subjected to similar conditions. This visual function is not necessarily measurable by the usual techniques of determining visual acuity,² as is evident from the data presented in this discussion.

The present investigation of the differences among individuals in the perception of low contrasts under low brightness-levels involved 50 adult subjects of an average age of about 30 years. These subjects possess *binocular*-visual-acuity ratings as follows: 39 subjects with 20/20 vision, 6 subjects with 20/40 vision, and 5 subjects with 20/60 vision. These data were determined with the 1932 American Medical Association chart uniformly illuminated to a brightness-level of about 6 foot-lamberts. This brightness is equal to that of a perfectly white, diffusely reflecting surface under an illumination of 6 foot-candles. Binocular measurements

were made as a matter of convenience in accumulating these data, although it was recognized that the usual monocular measurements are preferable in practice. In general, our subjects were free from visual defects arising from pathological causes. However, 26 of the 50 subjects wore eyeglasses, although some of these wore corrections only for near work.

The data of figure 1 show the relationships between measurements of visual function as determined with (1) the 1932 American Medical Association test chart at a distance of 20 feet, and (2) the Luckiesh-Moss Low-Contrast Test chart at a distance of 10 feet. The latter distance was selected merely from considerations of the visibility of the test objects of the low-contrast test chart. The latter consists of pairs of digits of modified Snellen design reproduced in various degrees of contrast with their dull white backgrounds as shown on the right-hand scale of figure 1. These test objects subtend an average over-all angle of about 35 minutes at the test distance of 10 feet. The critical details of the test objects subtend a visual angle of about 7 minutes at a distance of 10 feet. This is equivalent to a 20/140 Snellen rating. However, the size of each digit was individually fixed so that all of the digits used are of the same visibility for the same degree of contrast. Both charts were placed upon a white field approximately 5 by 6 feet and were *uniformly* illuminated to a brightness of 0.01 foot-lambert. This field may be considered as simulating a road surface. A 10-minute period was allowed for adaptation to this arbitrary brightness-level.

*From the Lighting Research Laboratory, General Electric Company.

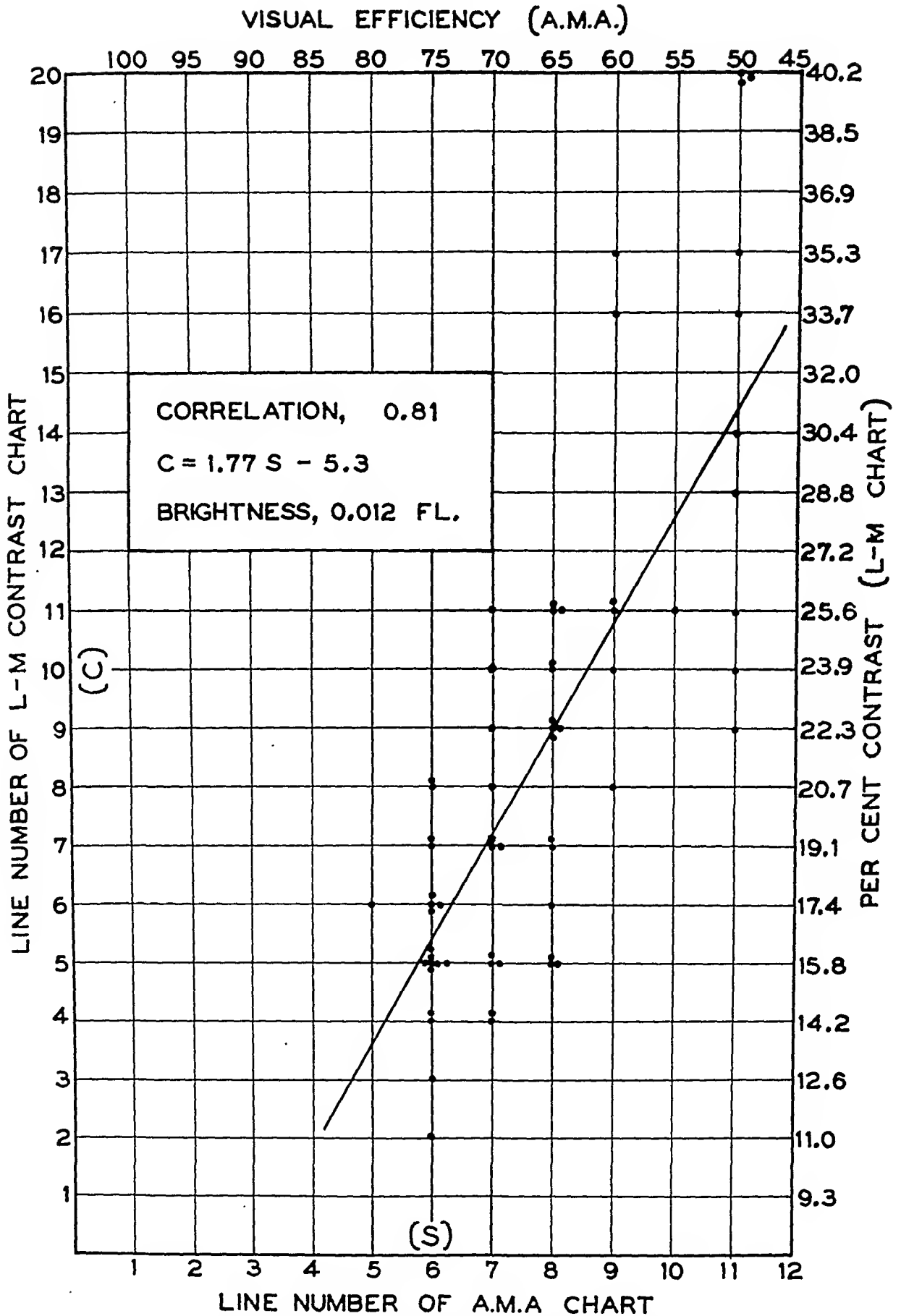


Fig. 1 (Luckiesh and Moss). The correlation between measurements of visual function determined with (S) objects of maximal contrast and various sizes, and (C) objects of various contrasts and constant size.

In general, it will be noted from figure 1 that the subjects possessing the same visual-acuity rating, as measured by the American Medical Association chart, varied rather widely in their ability to recognize the low-contrast test objects of the Luckiesh-Moss chart. For example, the threshold values of contrast varied from 20.7 percent to 11.0 percent for the group of subjects who were able to "read" line 6 of the American Medical Association chart. In this respect, it will be noted that the subject with the best vision among those who were barely able to read line 9 on the American Medical Association chart was visually equivalent to the subject with the worst vision among those who could barely read line 6. Thus many objects on the highway which would be visible to some of these subjects would not be seen by the others.² It is also probable that even greater differences in the thresholds of contrast would be obtained among a group of subjects possessing visual defects of a pathological character.

The coefficient of correlation between these two sets of measurements is 0.81. The magnitude of this datum is due to a large extent to the fact that the values corresponding to the lowest degrees of visual efficiency (American Medical Association scale) were obtained for 14 subjects without their usual corrections as well as with them, thus accounting for 64 plotted points on figure 1 obtained from 50 subjects. If the additional 14 sets of data are excluded, the coefficient of correlation is reduced to less than 0.60. This is a statistical indication that the two charts are not equivalent

as means for revealing individual differences in visual ability or visual function. In other words, it does not appear possible to use the American Medical Association chart as a substitute for the contrast chart even under low brightness-levels.

At low levels of brightness where contrast perception is a very important factor in seeing, the influence of both "corrective" and "tinted" lenses deserves some consideration. Even clear glasses reduce the brightness of objects at least 8 percent which is sufficient to depress below the threshold of visibility objects which are normally above the threshold. Obviously tinted glasses, which reduce the brightness still more than clear glasses do, will depress additional objects below the threshold of visibility. This applies to windshields as well as to lenses.

Some interesting observations were made pertaining to the effect of corrective glasses on the 14 subjects whose contrast thresholds were determined with and without them. In one case the contrast threshold was appreciably decreased when the subject removed his glasses. In some cases little difference was noted. In others considerable increase in contrast threshold resulted from the removal of the corrective glasses. These are matters of interest in addition to the general application of the criterion of perception of contrast in the determination of visual efficiency, particularly at low brightness-levels. In fact, throughout the realm of seeing, contrast sensitivity is deserving of more attention than it has received.

Nela Park

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TREATMENT OF GONORRHEAL OPHTHALMIA*

A. G. BOWER, M.D. AND WILLIAM FRANK, M.D.
Los Angeles, California

Before the advent of sulfanilamide, the treatment of gonorrheal ophthalmia was long, difficult, and disappointing. An average of 20 days elapsed before the first negative eye smear was obtained, and an average of 27 days was required for the treatment of the active infection. Too often vision was lost or severely impaired.

When reports of the successful treatment of gonorrheal urethritis with sulfanilamide became known, we determined to use the drug in our routine treatment of gonorrheal ophthalmia. Starting in June, 1937, we have had to date a series of 21 patients so treated, in which 18 have responded very satisfactorily with a first negative eye smear in two days, and in which the time of local treatment has averaged 10 days. Of these 18 patients, 10 were adults; two were children, five and nine years of age, respectively; and six were infants under 30 days. In this group, when the cornea was uninvolved on admission, vision was entirely preserved. In no case did corneal perforation occur. All the failures were in infants, two of whom were premature. In this series the number of days of local treatment required for cure is reckoned as the number of days that elapsed before irrigations could be reduced to every three or four hours *pro re nata*.

The treatment may be divided into two parts, local and general; each part is indispensable for best results. The local treatment consists of:

(1) Irrigation of the conjunctival sac every 10 to 15 minutes as long as pus is obtained. As the infection subsides and the formation of pus diminishes, the time

interval between irrigations is lengthened. Boric-acid solution or normal saline solution is used for the irrigation.

(2) One-percent atropine-sulfate solution instilled into the conjunctival sac as often as necessary to keep the pupil fully dilated.

(3) Ten-percent argyrol instilled into the conjunctival sac every hour until negative eye smears are obtained. This is probably unnecessary in most cases. We now have five patients, four adults and one infant, treated without argyrol, who have responded just as readily as those who received argyrol. We feel that the use of the mild silver salts can be restricted to the cases that do not respond readily to irrigation and sulfanilamide.

(4) One-percent AgNO_3 solution daily or every other day applied with a moistened cotton applicator to the tarsal conjunctiva when it becomes ulcerated and granular. This is used only when the infection has become chronic.

The general treatment consists of sulfanilamide and supportive care. Sulfanilamide is given in doses of 15 grains for every 20 pounds of body weight, divided into six doses and given every four hours. One fourth to one half the 24-hour dose is given on admission. When given subcutaneously a 1-percent solution of sulfanilamide is used: 100 c.c. for every 40 pounds body weight, given every 12 hours. The concentration of sulfanilamide in the blood should be kept above 5 mg. percent. These maximum doses are given until negative eye smears are obtained and the eye is obviously improved. The dosage is then gradually decreased in a period of three days to about one third the original amount and continued on the lowered figure for another 7 to 10 days. This is done to prevent relapse

*From the Department of Medicine, University of Southern California, and the Los Angeles County Hospital.

When acidosis is impending, sodium bicarbonate is given by mouth in the same dosage as the sulfanilamide. To detect impending acidosis, the urine is checked daily with nitrazine paper. Complete blood counts are made daily the first three days and then every third day to discover any idiosyncrasy to the drug.

The three failures were all in infants. The first was a 4-pound infant admitted with a bilateral involvement of 11 days' duration. Negative eye smears were obtained after $1\frac{1}{2}$ days of treatment, and the baby was discharged as cured on the seventh day, after negative eye smears had been obtained on five successive days. Five days after discharge the mother noted that the eyes were beginning to drain again. On readmission both eyes were again positive for the gonococcus. Upon reinstituting treatment, negative eye smears were obtained in $2\frac{1}{2}$ days, and the infection was promptly cured. We are presenting this case as a possible relapse. It may have been a reinfection from the mother.

The second patient was a 4-pound, 2-ounce baby admitted with an involvement of both eyes of a 1-day duration. Negative eye smears were obtained in 24 hours, and thereafter for five successive days. On the seventh hospital day sulfanilamide was discontinued because of vomiting. That day one eye had a relapse. Sulfanilamide was again started and increased to maximum doses, but this time without success. Not until after 77 days of continuous care was the infection finally cured. By that time the cornea was badly scarred. We feel now that the relapse probably could have been prevented had we continued small doses of sulfanilamide for a few days longer.

The third patient was a 6-pound, 4-ounce baby admitted with a bilateral involvement of 7 days' duration. After 3 days treatment the discharge was markedly decreased, requiring irrigations

only once an hour. At that time the sulfanilamide was reduced to one half the original dose. Negative eye smears had not yet been obtained. The eyes promptly became worse. Sulfanilamide was gradually increased to maximum doses, and although the eyes improved, they were not cured. Not until after 47 days was the infection finally stopped. We feel that in this case the blood sulfanilamide was reduced to a low level too soon. This time the end results were more fortunate, however, and both eyes were saved.

SUMMARY

Twenty-one cases of bacteriologically proved gonorrheal ophthalmia were treated with local measures and sulfanilamide. Eighteen responded successfully with a first negative eye smear in an average of two days, and with a local treatment requiring an average of 10 days.

In this group 10 were adults; two were children, five and nine years of age, respectively; and six were infants under 30 days.

In all cases when the cornea was uninvolved on admission, vision was entirely preserved. In no case did corneal perforation occur.

All of the three failures were in infants, of whom two were premature.

CONCLUSIONS

(1) Sulfanilamide is of great value in the treatment of gonorrheal ophthalmia when combined with adequate local therapy.

(2) Best results are obtained when a high blood sulfanilamide concentration is achieved early in the treatment and maintained long enough to secure negative eye smears.

(3) Relapse can best be prevented by continuing sulfanilamide in small doses for 7 to 10 days after the first negative eye smear.

LECTURES ON MOTOR ANOMALIES*

VII. PARALYSES: GENERAL SYMPTOMATOLOGY

A. BIELSCHOWSKY, M.D.

Hanover, New Hampshire

If, in a case of orthophoria, a single muscle becomes paretic, deviation of the paretic eye in the primary position must take place due to the loss of tonus of the paretic muscle, and the intact tonus of all the other muscles. The deviation of the paretic eye in the primary position of gaze will be either manifest or latent, according to the intensity of the paresis and the function of the paretic muscle. A latent or only temporarily manifest deviation results if, for instance, the internal rectus is weakened, since paretic divergence of not too high a degree can be overcome by a convergence impulse. But even a slight paresis of one of the elevators or depressors cannot be kept latent for the primary direction of gaze and with the head in the normal position, because the vertical range of fusion is very small. That is true only of cases of orthophoria. In a case of heterophoria the paretic deviation is modified by the anomalous position of rest—increased or diminished, or even abolished, or made up of various components—as will be shown presently in discussing the palsies of individual muscles.

If the paresis is the only cause of the deviation, the latter will disappear and the former orthophoria will be restored as soon as the paresis is cured; that is, as soon as the paretic muscle has regained its normal tonus. This cannot happen if the paretic deviation is caused not only by the normal tonus of the intact muscles but

also by the development of a secondary contracture of the antagonist of the paretic muscle, due to a change of the former's structure. In such cases a part of the deviation will remain even when the paresis is cured. In any case of typical paresis of a single muscle the angle of deviation increases or decreases according to whether the movement of the eye is in the direction of action of the paretic muscle or of its antagonist. The exceptions to this rule I shall discuss shortly.

The diagnosis of a muscular palsy, can easily be made if the movement of the paretic eye in a certain direction is limited. But in many cases of slight paresis there is no such limitation, because the limits of the ocular movements depend not only on the intact function of the ocular muscles but also to a considerable extent on the fascial check ligaments. In order to reach the normal limits of movement in the various directions a maximum innervation is not necessary. A moderate innervation is enough to bring the eyes to the normal limits, which the check ligaments do not allow to be exceeded, except in cases of paralyzes in which a structural change of the antagonist of the paralyzed muscle has taken place, due to a long-standing secondary contracture. Therefore, even a paretic muscle can bring the eye to the normal limit by means of an excessive innervation. Hence, as mentioned in the lecture on the physiology of ocular movements (Aug., 1938, p. 851), the uniocular field of fixation is of not nearly so great value for the diagnosis of a slight paresis as is the binocular field of fixation or the field of binocular single vision, the limits of which are nearly identical. According

* From The Dartmouth Eye Institute, Dartmouth Medical School. Read before the Seventh Annual Mid-Winter Clinical Course of the Research Study Club, Los Angeles, California, January, 1938.

to Hering's law of the equal innervation of both eyes, a motor impulse must produce a different effect on each eye if one of the muscles executing the bilateral movement is paretic. From this, a considerable limitation of the binocular field of fixation must result, even if both eyes, tested separately, are able to reach the normal limits of movement. The most important signs of the typical palsies—for instance, the difference between the primary and the secondary deviation, and its increase and decrease in looking in the direction of action of the paralyzed muscle or its antagonist—are derived from the aforementioned fundamental law of association of the movements of the eyes.

We speak of primary deviation if the normal eye is fixating. Secondary deviation is the deviation of the normal eye if the paretic one is taking fixation. The difference between the amount of the primary and secondary deviation is a characteristic of paralytic squint in its first and uncomplicated stage. If, for instance, the right eye is turned in at an angle of 10 degrees because of a paresis of its external rectus, while the left eye is looking at an object straight ahead, the latter will turn in at an angle of perhaps 20 degrees or more if it is covered, and the paretic eye is induced to look at the fixation object. The secondary deviation of the sound eye must be greater than the primary deviation of the paretic eye because the paretic external rectus would not be able to turn the right eye at an angle of 10 degrees from its convergent position into the median position by means of an innervation impulse that would bring about this movement in a normal eye. On account of the paresis, a much stronger dextroversion impulse must be given, to which the paretic eye responds with a movement of 10 degrees, while that impulse, according to the law of equal innervation of the two eyes, has the normal effect on the sound

eye so that it moves to the right at an angle of 20 degrees or more. It is easily understood that the more dextroversion is asked of a patient with right abducens paresis, the more will his right eye lag behind the left eye; whereas in levover-sion, in which the paretic muscle does not act as agonist, the deviation will decrease. Finally, in the left periphery of the field of fixation, binocular single vision will be possible, either because in that direction of gaze the right external rectus is completely relaxed also under normal conditions, or the fusion tendency may be able to overcome a slight residue of the paretic deviation by means of a compensating divergent innervation. In concomitant squint there is neither a difference between the primary and secondary deviation nor an increase, or decrease, respectively, of the angle of squint in dexto- and levover-sion, because the two eyes respond equally to the motor innervations.

The characteristic behavior of the paretic deviation just discussed is frequently missed in later stages of pareses. It is not unusual, in a case of abducens-nerve palsy that is quite typical in the beginning, to find that the difference between the primary and the secondary deviation decreases more or less gradually and at last disappears, the deviation thus becoming no longer distinguishable from a concomitant squint or from a divergence paralysis, particularly as the deviation even in looking toward the side of the paralyzed eye increases just as little as it decreases in looking toward the other side. This behavior can be explained in the following manner: If the paresis of the external rectus muscle improves, while a contracture of the internal rectus is at the same time developing, the deviation does not decrease but extends gradually over the whole field of fixation. In spite of the fact that the external rectus has regained its normal function the de-

viation may be maintained by the contracture of the internal rectus. This contracture, if it is only due to an increased tonus of nervous origin, can disappear in the course of time and binocular single vision can be restored in the whole field of fixation. In other cases the contracture becomes permanent by a gradual change of the muscular structure of the internal rectus. Then a concomitant deviation remains, the angle of squint being approximately equal in the whole field of fixation. I am sure that some cases of the latter kind have been mistaken for divergence paralysis, which is to be discussed later.

The amount of the paretic deviation varies individually within wide limits without being proportionate to the degree of the palsy. The photographs of a person with complete abducens-nerve paralysis show a very small primary deviation (A) and an enormous secondary deviation (B, fig. 20). In contrast to this, numerous

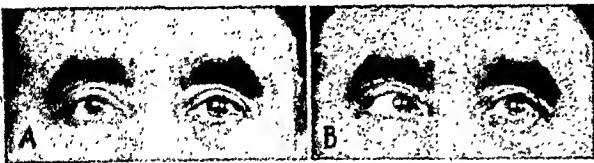


Fig. 20 (Bielschowsky). A, primary deviation is very small in spite of complete left abducens-nerve palsy. B, enormous secondary deviation.

patients with slight paresis display a considerable, even a very high, degree of primary deviation from the beginning of the disorder. These remarkable differences are due partly to individual differences in the general muscle tonus. In cases of an unusually small paretic deviation I have found the tendon reflexes unusually weak; on the other hand, in cases of a strikingly high deviation the reflexes have been abnormally increased. Neurologic examination has confirmed my assumption of an unusually weak or, on the other hand, an unusually increased



Fig. 21 (Bielschowsky). A, right abducens-nerve palsy with an extremely high deviation due to a maximal secondary contracture of the internal rectus which keeps the position of the right eye unaltered in spite of a maximal dextroversion impulse, B.

muscle tonus. However, I do not believe that the degree of paretic deviation depends wholly on the general muscle tonus. Possibly the region and the kind of lesion causing the paresis also influence the degree of the deviation. If a lesion in the nuclear region produces paralysis of the external rectus muscle and at the same time affects the fibers transmitting the impulse of inhibition to the internal rectus so that it cannot relax, one may assume that the paretic deviation will be higher than it would be in a case of basal abducens-nerve palsy, in which the inhibitory impulses going to the internal rectus are undisturbed. But this theory requires still further proof by research. Figure 21 A and B shows an extremely high deviation due to a maximal secondary contracture of the antagonist of the paralyzed muscle.

If a general practitioner is consulted by a patient because of a diplopia of paretic origin, he will not infrequently bandage the sound eye, taking it for the paralyzed one. This mistake is due to the patient's constant use of the paretic eye for fixation. There are several reasons why a secondary deviation takes place at

the beginning of the paralysis: First, the vision of the paretic eye is better, the nonparetic eye being amblyopic; second, since separation of the two images is much greater in secondary than in primary deviation, some patients prefer the former because diplopia is the less disturbing the more the double images are



Fig. 22 (Bielschowsky). Unusual habitual position of the head in a case of inveterate abducens-nerve palsy. While holding the chin pressed against his chest (A) the patient has binocular single vision. Pathologic convergence of a high degree occurs when the head is thrown back (B), while the same distant object is fixated.

separated; and, finally, some patients prefer fixation with the paretic eye because it has been dominant since childhood.

Another characteristic to be met with in all cases of pareses where binocular single vision has been retained in a certain part of the field of fixation, is a habitual anomalous position of the head. This is explained by many authors as an endeavor to make up for the function of the paralyzed or weakened muscle; it is obtained by turning the head in the direction of the action of the ocular muscle before it became paralyzed. This explanation is not invariably correct even for the external and internal rectus muscles, much less for the elevators and depressors. True, in most cases of palsy of the abducens nerve there is a habitual turning of the head to the side corresponding to the direction in which the

paretic muscle operates—for instance, to the right in a right abducens paresis, so that the patient looks at an object lying straight ahead with his eyes turned to the left; that is, in the direction in which action of the paretic right external rectus is not called for. Figure 22A shows a patient with abducens-nerve palsy holding the chin pressed against the chest. This position of the head helped the patient to secure binocular single vision, whereas if the head was thrown back (Fig. 22 B) so that the eyes had to look down, the pathologic convergence present in the primary position of the head was increased to a high degree. Why did not the patient turn his head to the side of the paralyzed abducens nerve? Because, due to the long duration of the palsy, secondary contracture of the internal rectus had set in, and the deviation could not be overcome by looking toward the sound side, as was possible in the early stages of the palsy when it was slight and uncomplicated. On the other hand, it is a physiologic law that the elevation of the eyes favors divergence, just as the downward gaze disposes to converge. Both tendencies are due to the mechanical factors influencing the position of the eyes. With few exceptions, in cases of orthophoria one finds latent divergence when the eyes are looking up and latent convergence when they are looking down. Therefore, in cases of slight or moderate convergence in the primary position of the eyes, the deviation may disappear if the patient looks up or lowers the head, whereas it is increased by looking down, or, on the other hand, throwing the head back. The reverse is true in cases of latent or manifest divergence.

The rule under discussion concerning the so-called vicarious rotations of the head proves to be inaccurate in palsies of a single elevator or depressor muscle

much more frequently than in cases of palsy of the external or internal rectus. It is valid only if both elevators or both depressors of one or both eyes are paralyzed; in such cases the head is rotated around the frontal axis—that is, thrown back or depressed. But in pareses of an individual vertical motor, the position of the head is seldom in accordance with this rule. In cases of trochlear-nerve palsy, for instance, the head is usually tilted toward the shoulder of the sound side and at the same time turned around the vertical axis so that the paretic eye is rotated outward. Indeed, in cases of very slight paresis, the position of the head will show only one of the components just mentioned. If the right superior rectus muscle is paralyzed, the face is often turned only to the right, so that the paretic eye is averted. How can such a position of the head effect binocular single vision if an elevator muscle is paretic? The vertical rectus muscles have the greatest influence on the vertical movements when the visual line is averted so that it lies within the muscular plane. The more it moves away from this plane, the more do these muscles lose their influence as elevators and depressors, whereas the influence of the oblique muscles on the vertical movements increases simultaneously in nearly the same proportion. Therefore, a slight vertical deviation due to the paresis of the right superior rectus will disappear if the paretic eye is averted in consequence of the head being turned to the right.

The rule concerning the vicarious rotation of the head must be modified as follows: The patient chooses the least inconvenient position of the head by which the paretic muscle is sufficiently relieved so that binocular single vision can be obtained.

Another symptom of ocular palsy,

called false orientation, is interesting from a scientific point of view, although one can dispense with it for diagnosis. If the patient, while covering his sound eye, is asked to point toward an object situated in front of him or in the field governed by the paralyzed muscle, the finger will point more or less beyond the object and toward the field of action of the paretic muscle. The more the muscle is paralyzed, the more the pointing finger will deviate from the correct position. The origin of this error is obvious: The egocentric (absolute) localization of objects in space is approximately correct as long as the correlation between the innervation of the ocular muscles and its effect is correct; that is, as long as the amount of the actual movement corresponds to that which is intended. But if the right eye is deviated inward, owing to a paresis of the external rectus muscle, and one asks the patient, while covering his left eye, to fixate an object in the median plane of his head, he will have to give a dextroversion impulse, from which he will get the idea that the object to be fixated lies to the right of the median plane. On measuring the error found in the pointing test by a method more exact than this primitive test, one will find that the angle coincides with the secondary deviation; that is, the visual axis of the covered, sound eye is directed to the point at which the paretic eye localizes the fixated object. This behavior is found only in cases of a recent palsy. If the patient is using the paretic eye continually for fixation, the egocentric localization will soon be adapted to the changed relations between innervation impulse and its effect, and the false orientation becomes rectified. But then one will find a different kind of false localization in testing the nonparetic eye while the paretic eye is covered. The patient will point wrongly, but to the

opposite side—that is, to the left—if the normal left eye, which usually is in secondary deviation, is induced to fixate. This kind of false localization is called spastic, in contradistinction to the paretic localization just discussed. Spastic localization is the term for the opposite disproportion between motor innervation and its effect after the innervation in such a case has become adapted to the paresis of the fixating eye, so that it is stronger than is required by a normal

mate information may be obtained about the kind and intensity of the disturbance and so that one may be able to check the reliability of the patient's subjective statements, particularly in the diplopia test. The latter is frequently not necessary for the diagnosis if the objective signs are unequivocal. It is indispensable for obtaining an exact measurement of both the kind and the amount of the deviation in the different parts of the field of fixation; it is the basis for a comparison of

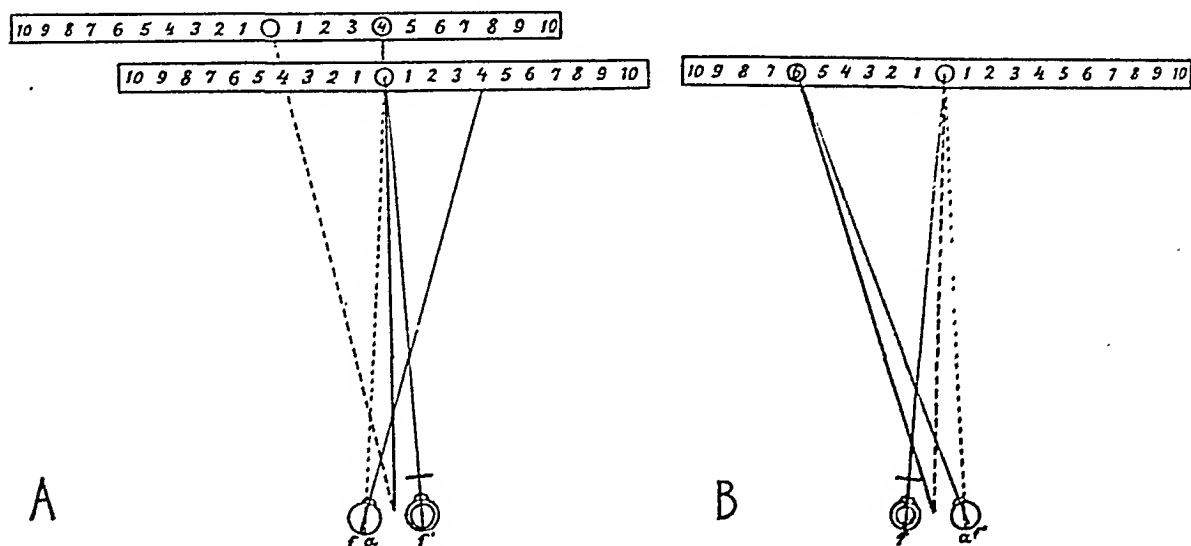


Fig. 23 (Bielschowsky). Diplopia test in a case of left abducens paresis. A, shows the primary deviation while the normal eye is looking through the red glass at the light in the center of the tangent scale. The left visual line is directed to the right number four which, accordingly, is seen to coincide with the red light; the white light being imaged on an eccentric point (α) must appear displaced to the left of the red light at an angle determined between α and the fovea (f). The upper tangent scale in A indicates the displacement as seen by the patient; B, shows the secondary deviation brought about by having the patient's left eye look through the red glass at the fixated light.

muscle for the given amount of movement. Patients with recent paresis suffer more or less from vertigo that is due to the disturbance of the egocentric localization. The patient sees apparent movements of the outlying objects, the double images of which now approach, now separate, according to whether the direction of gaze is outside or inside the field of action of the paretic muscle.

In every case the examination of the objective signs ought to precede that of the subjective symptoms so that approxi-

mate information may be obtained about the kind and intensity of the disturbance and so that one may be able to check the reliability of the patient's subjective statements, particularly in the diplopia test.

The patient is seated with his head in the normal position facing the light in the center of the tangent scale, which, as a rule, is at a distance of 2.5 meters, on a level with his eyes, and in the median plane of his head. A dark-red glass is put, first in front of the normal eye, then in front of the paretic one. The red glass should be so dark that the eye behind it

sees nothing but the colored light. Suppose a patient with a left abducens paresis has the red glass before his right eye. He sees a red light and a white light. Asked on what number the red light lies, he will say that it coincides with the black number four (fig. 23). Now we know that while the right eye is looking through the red glass at the light the visual line of the paretic eye passes through the right number four—the light and number four being imaged on the two foveæ. Since the patient is sitting at a distance of 2.5 meters from the scale and the numbers correspond to arc degrees at a distance of 5 meters, the separation of the double images amounts to 8 degrees. Turning the patient's head first to the left and then to the right, while he is continually looking at the light, so that his eyes go first into dextro- then into levoversion, he will first see the red light coming nearer, then moving farther away from the white light. In this way the behavior of the double images is tested for the whole field of fixation. Without going into all the details, I will discuss only the influence that the change of fixation has on the diplopia in our case. If the red glass is put in front of the left (paretic) eye the red light will appear on the red number 6. Thus there is again uncrossed diplopia, but the separation of the double images has increased to 12 degrees. This increase is due to the fact that it is the secondary deviation that has just been measured. It is to be borne in mind that in using the red glass or the Maddox rod in the diplopia test and asking where the red light is seen, the fixating eye is the one in front of which the red glass has been put. If the patient with a left abducens paresis is questioned, he will say that the tangent scale is displaced to the left as indicated by the upper scale in A (fig. 23), while the red glass is being held before the

right eye; whereas, the scale appears in its right place if he has the red glass before his left eye. The different localization will be understood if one considers that while the sound eye is looking through the red glass, the principal visual direction in which the foveal images—namely, the red light as well as the right number four—are localized, lies in the median plane of the head. If the right number four appears in the median plane the whole tangent scale must, accordingly, appear displaced to the left at an angle of 8 degrees. On the other hand, if the left (paretic) eye is looking through the red glass at the light, it will be seen lying on the left number six, to which the right visual line is directed. Now the visual direction in which the two foveal images appear does not coincide with the median plane because the two eyes are held in the present position by a voluntary levoversion impulse, which is required to bring the normal eye from the primary position to a levoversion of 12 degrees. Figure 24 shows crossed diplopia due to a paretic divergence tested on the tangent scale in the same way as has been described for uncrossed diplopia.

The behavior of the diplopia in the different kinds of pareses may be summarized as follows:

1. Uncrossed diplopia points to a deficiency of one or several muscles with an abverting component, while crossed diplopia points to a deficiency of muscles with an adverting component. In the former group the visual lines converge; in the latter group they diverge.

2. Increase of the lateral distance between the double images in dextroversion is due to a paresis of a dextrovertor of that eye to which the image farthest to the right belongs, that is, the right external rectus if there is uncrossed, the left internal rectus if there is crossed diplopia.

3. Lateral distance is frequently influenced by vertical movements of the eyes since elevation favors a divergent, depression a convergent position of the eyes, due to anatomico-mechanical factors. Hence, crossed double images will, as a rule, move farther apart in the upper, and approach each other in the lower part of the field of fixation, while uncrossed double images will show a de-

crease, while an oblique muscle is concerned if the increase of the vertical divergence is connected with the adversion and the decrease with the abversion of the paretic eye. This behavior is due to the fact that the vertical recti or the oblique muscles act at their best as vertical motors according to whether the eye is turned out, or, on the other hand, turned in, so that the visual line either coincides with or is

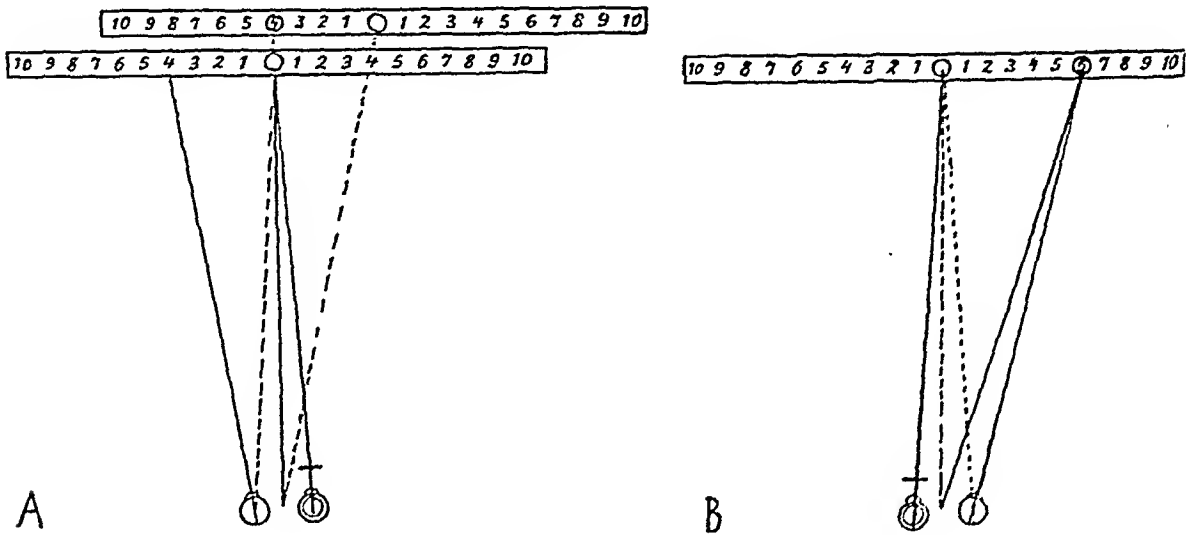


Fig. 24 (Bielschowsky). Crossed diplopia due to a paretic divergence. A, shows a primary deviation of 8 degrees while the normal right eye is looking through the red glass at the light, while in B the secondary deviation (12 degrees) is brought about by the transition of the fixation from the right to the left (paretic) eye.

crease of their separation in the lower, an increase in the upper half of the field. A small minority of cases presents the reverse behavior.

4. Vertical diplopia with an increasing separation in elevation points to a paresis of one or both elevator muscles of that eye to which the upper image belongs; while the vertical diplopia which increases when the gaze is lowered, is to be attributed to a paresis of one or both depressors of the eye with which the lower image is seen.

5. Vertical divergence increasing in that lateroversion by which the paretic eye is turned out, and decreasing when looking to the opposite side, points to a paresis of one of the vertical recti mus-

cles, while an oblique muscle is concerned if the increase of the vertical divergence is connected with the adversion and the decrease with the abversion of the paretic eye.

6. If the vertical separation of the double images is combined with a minor horizontal component that does not show the characteristics of a paresis of an internal or external rectus, the lateral deviation is not a decisive factor in the analysis of the paretic disturbance, because rather frequently a nonparetic exophoria or esophoria becoming manifest if fusion is broken by the paretic vertical diplopia, may compensate or even overcompensate the slight horizontal deviation caused by a paresis of one of the vertical motors. Thus, for instance, in 25 percent of trochlear palsies one does not find an

uncrossed beside the vertical diplopia, due to the absence of the abverting component of the oblique muscle, but either no lateral separation at all, or even a crossed separation in cases in which an exophoria, latent before the onset of the paresis, has now become manifest. It goes without saying, that the vertical separation of double images also may be due to a nonparetic hyperphoria that has become manifest after the appearance of a paresis of a lateral muscle.

7. An obliquity of one or both of the double images shows that the physiologic parallelism of the corresponding retinal meridians is lost, a phenomenon suggesting that the balance between the muscles with antagonistic rotary components is disturbed. In order to find out whether the obliquity is due to a disclination (extorsion) or conclination (intorsion) of the vertical meridians, the double images should be examined, not in the old-fashioned manner with a candle for fixation, but with a horizontal object; for instance, with the horizontal arm of the tangent scale. The obliquity of the two images of a vertical object like a candle looks quite different according to whether there is, besides the vertical separation, homonymous or crossed diplopia. In spite of the same paretic disclination, the two images (fig. 25) of a candle will converge or diverge upward according to whether there is homonymous or crossed diplopia; in this way a mistake in diagnosis can arise. It is easy to avoid this mistake if one uses a horizontal object in testing for vertical combined with lateral diplopia. In any case of trochlear-nerve palsy, for instance, the paretic disclination makes the double images converge to the paretic side, whether there is homonymous or crossed diplopia besides the vertical separation.

From the obliquity of the double images one can infer only that there is either

an abnormal disclination or conclination of the vertical meridians, because of a deficiency of muscles with an inward, or, on the other hand, an outward component. But one does not know which eye is the paretic one, since some patients will see the images aslant that belong to the nonparetic eye; while in other cases both

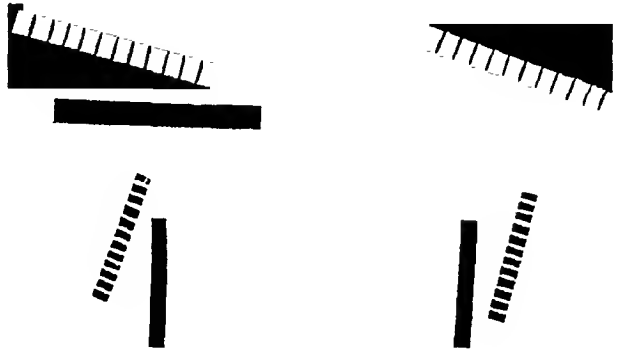


Fig. 25 (Bielschowsky). Different appearance of the double images of a vertical and of a horizontal object in trochlear-nerve palsy according to whether there is, besides the vertical separation, homonymous or crossed diplopia. Though the paretic extorsion is the same in either case, the two images of a vertical object will converge or diverge above, whereas the two images of a horizontal object in such cases will always converge to the paretic side.

images will appear oblique. The former will occur if the paretic eye, being dominant, is used ordinarily for fixation. Then a horizontal contour will appear horizontal to the paretic eye although it is imaged on an oblique meridian, while the nonparetic eye will see that contour aslant despite the fact that its image lies in the horizontal meridian; for as long as the localization of the images of the two eyes relative to each other is dependent on the innate sensorial correspondence, images lying on noncorresponding meridians are localized in different planes deviating from each other by the angle at which those noncorresponding meridians deviate from each other. Since the egocentric localization of outlying objects is not based on innate conditions but acquired during life by daily experiences, it can be adapted to abnormal conditions.

A patient with trochlear palsy, as a rule, will see—while the normal eye is covered—the horizontal and vertical contours of a room as they are, since he knows from experience that, for instance, the contours of the walls or the doors are horizontal and vertical. But if he is examined in a dark room where he sees nothing but a faintly glowing thread, he will see it with the paretic eye either vertical or horizontal only if the position of the thread corresponds to the oblique position of the vertical or horizontal meridian of that eye.

In typical pareses of a vertical motor one knows from the aforementioned data of the investigation, particularly from the fact that the vertical divergence increases either in the upper or lower half of the field of fixation, whether an elevator of the right, or a depressor of the left eye is paralyzed. The obliquity of the image belonging to the paretic eye coincides with the direction in which the horizontal meridian would be rotated by an isolated action of the paretic muscle. A patient

with a right-trochlear-nerve paresis, for instance, will see the left end of the lower image of a horizontal contour tipped downward; that is, in the same direction as the horizontal meridian of the right eye would be tipped by an isolated action of the right superior oblique. If such a paresis belongs to those cases in which the paretic eye is used for fixation, the lower image will be seen horizontal, while the right end of the upper image, seen with the nonparetic eye, is tipped down. In either case the right ends of the double images will converge, pointing to a meridional disclination if the lower image is seen with the right eye, while convergence of the left ends would point either to disclination if the lower image belonged to the left eye, or to condination if it belonged to the right eye.

Further details of the behavior of the double images in the different parts of the field of fixation, as well as with the patient's head in different positions, will be mentioned in the discussion of the pareses of the individual muscles.

RESULTS OF VITAMIN-D-COMPLEX TREATMENT OF KERATOCONUS*

PRELIMINARY STUDY**

ARTHUR ALEXANDER KNAPP, M.D.

New York

In previous communications¹ Blackberg and I described the consistent production of keratoconus in dogs and rats fed a vitamin-D-deficient, low-calcium diet. The eyes of some of the dogs were enucleated and examined microscopically.

Because of the findings in these specimens, it was thought advisable to treat patients suffering from keratoconus with a vitamin-D and calcium diet.

Eleven patients (18 eyes) were included in this study. Seven had bilateral involvement. Three had a right keratoconus and one a left. The degree of conicity varied from the almost imperceptible to the very marked, with rupture of the posterior corneal layers and central opacity.

Each of the patients was given 60 drops of viosterol² after breakfast. More recently however, up to 200 drops have been prescribed. The calcium, taken before the meal, varied with the milk intake. If a patient drank one quart of milk a day, one Mineral Mixture Tablet was given. For each glass less than one quart, two tablets were ordered. So, if a patient drank no milk, he would receive nine tablets daily.

These patients have been observed for varying periods of time, from three

*From the New York Eye and Ear Infirmary and the Montefiore Hospital, through the generosity of the attending eye surgeons of these institutions.

Read before the New York Academy of Medicine, Section on Ophthalmology, December 20, 1937, and the North Jersey Academy of Medicine, Section on Ophthalmology, May 9, 1938.

**The subject matter of this paper is substantially that presented in the June, 1938, issue of The Journal of The American Medical Association. The charts are presented here for the first time.

months to three years. It will be noticed that in every case there was subjective and objective improvement. Subjectively, the vision improved. Objectively, the improvement was seen by macroscopic, corneal microscopic, cycloplegic refraction, and ophthalmometric examinations. Recently, to be more accurate, plaster-of-Paris casts of the eyes have been used to measure the height of the cones before and after treatment. Twelve molds of six eyes, replicas of the corneas of the eyes of three patients before treatment and three to six months after, were carefully measured by Professor Carlos de Zafra of the engineering department, assisted by Professor Louis Granath of the physics department of New York University. All of the six later molds showed a flattening of the cone. The height of five of these was reduced. One manifested an apparent increase in the height of the cone, but this may not be an actual increase; for it might be mentioned that these cones were measured by taking a chord of the anterior segment of the eyes, using a fixed base line. With shrinkage of the cornea, the base line included a greater portion of the anterior segment. Actually, therefore, the sixth mold also may have a reduced cone. Practically, this may be seen after examining the eleventh patient. Three years ago she presented herself, with palpebral fissures approximately equal in their vertical meridians. In the right eye she had an advanced keratoconus; in the left, a mild myopia. She has been under treatment during this time. For the past year she has been conscious of a ptosis of her right upper lid.

TABLE 1
DATA ON VITAMIN THERAPY IN KERATOCONUS

Name	Age	Sex	Race	Degree of Keratoconus	Improvement with Vitamin-D-Complex Treatment	
					Subjective	Objective
1. N. L.	39	M.	W.	Marked in O.D. with central nebula. Mild in O.S.	Driving a car at night is much simpler. Spider-web effect of lights not so disturbing. Pins in bowling alley now distinct. Eyes not irritated. Headaches much relieved. Without treatment, symptoms worse.	<p>Height of corneal apex from common base line:</p> <p>Molds: Before therapy After 6 mos. Difference</p> <p>O.D. .1478" .1448" 0.0762 mm.</p> <p>O.S. .1262" .1014" 0.6292 mm.</p> <p>Cycloplegic refraction:</p> <p>Before therapy, O.D. -11.00 D. cyl. ax. 40°</p> <p>O.S. - 5.75 D. cyl. ax. 140°</p> <p>After 6 mos., O.D. - 9.50 D. cyl. ax. 40°</p> <p>O.S. + .50 D. sph. ≈ -5.75 D. cyl. ax. 140°</p> <p>Corneal microscope—thicker central cornea.</p> <p>Macroscopically—apex of cone less prominent.</p> <p>Vision of O.D. improved from 7/200 to 15/100+ in six months. O.S. from 15/20- to 15/20 with correction: O.D. from 15/100+ to 15/50- O.S. from 15/15- to 15/15</p>
2. F. C.	23	F.	W.	Marked in O.D. Moderate in O.S.	Vision definitely clearer.	<p>Height of corneal apex from common base line:</p> <p>Molds: Before therapy After 3 mos. Difference</p> <p>O.D. .1359" .1307" 0.13098 mm.</p> <p>O.S. .1356" .1154" 0.51308 mm.</p> <p>Corneal microscope—denser cone.</p> <p>Macroscopically—cones lower and flatter.</p> <p>Vision O.D. without correction 20/100; after 3 mo. 20/50-</p> <p>O.S. without correction 20/100; after 3 mo. 20/50</p>
3. S. S.	37	M.	W.	Marked in O.U.	"Eyes altogether different now. Eyes used to shake, and almost blind. They are not so weak any more." Sees and picks up pickles with greater ease. Clock observed at further distance.	<p>Height of corneal apex from common base line:</p> <p>Molds: Before therapy After 3 mos. Difference</p> <p>O.D. .1206" .1104" 0.25908 mm.</p> <p>O.S. .1296" .1365" 0.17526 mm.</p> <p>Corneal microscope—hyperbolic curves less acute.</p> <p>Macroscopically—cones flatter, with radius of curvature more uniform.</p>
4. A. D.	25	F.	W.	Marked in O.D. with central macula Mild in O.S.	Doesn't bump into doors and things now. Doesn't get things in eyes. Able to play cards now. Letters are more distinct—previously had lines running up and down. Pictures are not "cockeyed." Eyes are not "stiff." Formerly could not read nor sew at night with any comfort. Easier to dance.	<p>Cycloplegic refractions:</p> <p>Before therapy, O.D. unimproved</p> <p>O.S. +.25 D. sph. ≈ -1.75 D. cyl. ax. 105°</p> <p>After 10 mos. O.D. unimproved</p> <p>O.S. +1.00 D. sph. ≈ -2.00 D. cyl. ax. 95°</p> <p>Corneal microscope—thicker central cornea.</p> <p>Macroscopic improvement—lower and flatter cones.</p> <p>Vision O.S. with correction 20/30-; after 10 mo. 20/20.</p>
5. A. S.	60	M.	W.	Marked in O.U. with corneal maculae.	Vision improved. No more pain in eyes.	<p>With correction</p> <p>Before, O.D. -2.00 D. sph. ≈ -.50 D. cyl. ax. 75° = 20/70-</p> <p>O.S. -1.50 D. sph. ≈ -1.00 D. cyl. ax. 180° = 20/70-</p> <p>After 6 mos., O.D. -4.50 D. sph. ≈ +9.00 D. cyl. ax. 172° = 20/50</p> <p>O.S. -10.50 D. sph. ≈ -5.50 D. cyl. ax. 75° = 20/50</p> <p>Corneal microscope—thicker membrane.</p> <p>Macroscopic improvement comparatively marked.</p>

TABLE 1—Continued

Name	Age	Sex	Race	Degree of Keratoconus	Improvement with Vitamin-D-Complex Treatment	
					Subjective	Objective
6. M. B.	32	M.	W.	Normal O.D. Mild in O.S.	Sees better. Eyes less tired.	Vision of O.S. improved from 10/200 to 20/100 in 8 mos. Cycloplegic refraction: Before, -3.00 D. cyl. ax. $70^{\circ}=15/200$ After, $+ .75$ D. sph. ≈ -2.50 D. cyl. ax. $75^{\circ}=20/70$ Corneal microscope—denser membrane. Macroscopically improved, with flatter cone.
7. V. P.	37	F.	W.	Mild in O.U.	Vision clearer and better. No more distortion of objects, as believing that a man crossing the street was riding a bicycle, or mistaking a lemon for an orange. Does not "squint" now and eyes do not tear. Does not have headaches after movies now. Symptoms returned when patient was without medication for 8 weeks.	Vision O.U. improved from 20/200 to 20/100 in 7 mos. Cycloplegic refraction: Before, O.U. -1.00 D. cyl. ax. $90^{\circ}=20/70$ After, O.D. $+ .25$ D. sph. ≈ -1.00 D. cyl. ax. $40^{\circ}=20/40$ O.S. $+ .50$ D. sph. ≈ -1.00 D. cyl. ax. $90^{\circ}=20/30$ Corneal microscope—denser central membrane. Macroscopic improvement.
8. C. P.	20	F.	W.	Mild in O.D. with leucoma (esotropia and lens opacity)	Painful and tearing eyes improved. Vision slightly better.	Cycloplegic refraction from -10.00 D. sph. to -8.00 D. sph. ≈ -1.00 D. cyl. ax. 15° , in six months. Corneal microscope—thicker central membrane. Macroscopically—less prominent and flatter cones.
9. M. C.	43	M.	W.	Mild in O.D. Moderate in O.S., with central nebula	Vision much clearer. Faces and objects more distinct. Worse without medication.	After 2 years, ophthalmometer shows astigmatism of O.D. to be more regular. Corneal microscope—thicker central membrane. Macroscopically—less prominent and flatter cones.
10. E. W.	29	F.	W.	Marked in O.D., with central macula. Moderate in O.S.	Vision improved. People in moving pictures much more distinct. Able to sit further back in theater. Reading and sewing done with greater ease.	Vision improved O.D. 5/200 to 15/200 in 7 mos. O.S. 15/200 to 15/70 Cycloplegic refraction: Before, O.D. unimproved 5/200 O.S. -1.00 D. sph. ≈ -7.00 D. cyl. ax. $85^{\circ}=15/100$ After 7 mos., O.D. -1.25 D. sph. ≈ -8.50 D. cyl. ax. $100^{\circ}=15/100$ O.S. $-.25$ D. sph. ≈ -7.00 D. cyl. ax. $85^{\circ}=15/50$ Corneal microscope—thicker central membrane. Macroscopically—cones less prominent and flatter.
11. B. M.	34	F.	W.	Marked in O.D., with central macula. Absent in O.S.	Drooping of right upper lid.	Pressure bandage and simple iridectomy of no avail. After 3 years' therapy conus has diminished greatly. There is a ptosis with a narrowed palpebral fissure. The cornea is smaller, with an excess of tissue heaped up in the central vertical meridian, over the former site of an epithelial cyst. Corneal microscopy—thicker central cornea.

In all probability, this ptosis is due to a shrinkage of the cornea, as well as of the sclera. For, as will be shown in a later paper, the sclera, too, may shrink.

CONCLUSION

From the foregoing data, it may be concluded that the vitamin-D complex has a definite place in the therapy of kerato-

conus. Further research will determine its proper position in the therapeutics of this condition.

Miss Diana Shrage of the New York Eye and Ear Infirmary assisted in this work. Products used in the study were supplied by the Mead Johnson Company of Evansville, Indiana.

35 East Sixty-fourth Street

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- ²Mead Johnson Company's products: Viosterol: One gram contains not less than 10,000 vitamin-D units (U.S.P.), 40 drops to a gram. Mineral Mixture Tablets, No. 85; Composition: alfalfa ash 45 percent, dicalcium phosphate 32 percent, edible bonemeal 64 percent; analysis: moisture 2 percent, protein 6 percent, fat 2 percent, minerals (ash) 90 percent, each tablet supplies calcium 140 mg., phosphorus 83 mg., iron 1 mg., copper 0.05 mg., magnesium 2.8 mg., sodium 5 mg., potassium 5 mg.

PROBLEMS IN THE DIAGNOSIS OF ABSCESS AND TUMOR OF THE ORBIT*

WILLIAM L. BENEDICT, M.D.
Rochester, Minnesota

Whenever it becomes necessary to determine whether a pathologic condition within an orbit is due to abscess or tumor, consideration of certain factors becomes of decisive importance. The problem of distinguishing between these two pathologic processes is complicated by the fact that the outstanding signs and symptoms, which are common for both conditions, are also found in aneurysm of the ophthalmic artery, in cavernous-sinus thrombosis, in pseudotumor, and in orbital complications of Hodgkin's disease, tularemia, Parinaud's conjunctivitis and other local or systemic diseases, or following trauma. Obviously the diagnosis is not always clear by inspection alone. The history of the onset and progression of symptoms is of equal importance to the status prior to the beginning of noticeable changes and to the physical findings of a corroborative nature. The differentiation hinges on the history, physical findings, functional changes, re-

sponse to treatment, and, finally, on histopathologic examination.

It is not often that one is called on to utilize all or even most of these factors to distinguish between orbital abscess and orbital tumor. In the majority of cases the evidence in favor of one or the other condition is so marked that only one probable diagnosis can be substantiated. Acute cellulitis that subsides with the formation of a palpable, fluctuant mass points only to an accumulation of pus and débris. The chance that any other pathologic condition may also be present is unthinkable rare, although the possibility must not be lost sight of, because the unfortunate incising of an aneurysm under the impression that an abscess was being drained has led more than one surgeon to regret his action.

Acute cellulitis may arise from localized periostitis within the orbit, and, when situated along the roof of the orbit, the differential diagnosis becomes of importance because of the proximity of such a lesion to the brain. Most suppurative lesions of the orbit, whether originating in periostitis, invasion from infected

* From the Section on Ophthalmology, The Mayo Clinic. Read before the meeting of the Pacific Coast Oto-Ophthalmological Society, Victoria, British Columbia, June 21 to 24, 1938.

sinuses, or from introduction of foreign bodies from without by penetrating injuries, tend to become walled off by a surrounding infiltration and gradually work toward the orbital outlet, where they point in the lid, open, and become fistulous tracts. The anatomic structure of the orbit permits three potential spaces for abscess formation: (1) between the bone and periorbita, particularly along the roof; (2) between the periorbita and the muscle cone, and (3) within the cone itself. Of these potential spaces, orbital abscesses are found most frequently in the one first mentioned, for the reason that most of them are due to lesions that invade the orbit from without; that is, from the frontal or ethmoidal sinus. Consequently, in the absence of localizing signs, exploration of the orbit for relief of abscess should be directed toward the roof between the bone and the periorbita. Incision should be made through the skin of the lid just beneath the brow and the superior orbital margin.

It is fortunate that neoplasms of the orbit do not break down into cystic masses and that chronic inflammatory lesions of the orbit seldom take on malignant characteristics. With the exception of mixed tumors of a low grade of malignancy and some of the mixed basal-cell and squamous-cell carcinomas, neoplasms of the orbit, both primary and metastatic, increase in size along directions of least resistance and without signs that are indicative of abscess formation. However, in a case of extensive melanoma of the orbit which required exenteration, I found that the posterior third of the orbit contained only a thick black fluid with degenerated tissue débris, in many respects the complete counterpart of a cold abscess. This patient had deeply pigmented pharyngeal, nasal, and buccal mucous membranes without characteristic signs of malignancy and is alive and

well more than 10 years after the exenteration.

Exophthalmos is the outstanding indication of increased mass within the orbit and is present as the first sign in most diseases of the orbit. The bony walls of the orbit offer resistance to the expansion of a new growth or abscess, to an increase in the size of an aneurysm, or to the edema of orbital tissues in goiter; as a result, the membranous anterior wall gives way, permitting the eyeball to move forward. There are two elements in exophthalmos that are significant, the rate of progress and the lateral or vertical displacement.

If fluid is injected into the orbit, the eyeball moves slowly and steadily straight forward and becomes fixed and immobile. The dispersion of the injected fluid within the orbit is not impeded, and the eyeball moves forward without lateral displacement. I have seen one case of traumatic arteriovenous aneurysm of the orbit in which the history of the development of the exophthalmos was very important. A child's right orbit was injured by a pitchfork tine when the child slid down a haystack. On examination at the clinic several days later, the eyelids were markedly edematous and discolored, the conjunctiva congested and chemotic, the eyeball pushed forward and immobile, and the cornea clear; vision was 6/10 without glasses. There was little pain or tenderness. A slight thrill synchronous with a slight bruit pointed to arteriovenous aneurysm, but whether they were the result of direct injury or of subsequent erosion through suppuration was the question. The child had no fever and the blood count was normal. The most significant factor, to my mind, however, was the statement in the history that, immediately after the injury, the proptosis of the eyeball and swelling of the lids was as great as it had been at any time since, the only change in the picture having

been the congestion of the conjunctiva and discoloration of the eyelids which developed slowly afterward. As there were no definite signs of infection, exploration was not indicated. A mild pressure bandage worn for a few weeks was sufficient to bring about complete recovery. The proptosis was due to extensive hemorrhage from a wounded orbital vessel, probably an artery, because pulsation of the proptosed eye was visible for several weeks. This seems to indicate that fluid within the orbit, whether from an external or internal source, if unimpeded by artificial barriers will become evenly dispersed and produce proptosis without lateral displacement of the eyeball.

The contrary condition is found in the case of very slow-growing tumors of the bony walls of the orbit. Osteomas do not grow in the direction of least resistance. They invade the orbit or the cranial cavity, or the bony framework of the face or head, without regard to resistance. Osteomas of the orbit arise within a paranasal sinus and are always covered by a mucous membrane continuous with the lining of the sinus of origin; by continuous expansion the cavity becomes filled with a bony tumor. Barriers, of whatever nature, are eroded by pressure of the advancing osteoma, but the adjustment is so slow that external deformity is a late manifestation and proptosis is seldom extreme. Lateral displacement of the eyeball is quite marked, however, if the osteoma is in the anterior third of the orbit, less so if the tumor is in the middle or posterior third. Furthermore, a slow rate of growth of either a tumor or an abscess permits adjustment within the orbital tissues, so that proptosis develops only after the mass has reached considerable size, and then it progresses less rapidly.

For a given amount of increased mass within the orbit, proptosis is developed

in proportion to the rate of increase in the mass. From this generalization one may infer that the size of a tumor or abscess cannot be estimated with even fair accuracy by the extent of proptosis alone, and that the duration (or age) of a slow-growing tumor can be estimated only approximately by the onset of proptosis. Tumors and abscesses act in a similar manner to produce exophthalmos, and differentiation of the two conditions cannot therefore be made on the basis of the proptosis alone. This applies particularly to cold abscesses and localized inflammatory masses due to tuberculosis and to syphilitic periostitis and gumma.

Rapid swelling of the tissues of the orbit, accompanied by proptosis, pain, tenderness, and loss of mobility of the eyeball in a person with arthritis, gout, or other constitutional disorders of metabolism, may be suspected to be cellulitis of the orbit; this may lead to abscess or to localized hemorrhage accompanying thrombosis of an orbital vein. Vascular accidents occur along the sheaths of the optic nerve and give rise to retinal venous engorgement and edema of the disc and adjacent retina without producing scotomas or other visual impairment. Also, along the tendons and, indeed, throughout the orbit, hemorrhages frequently appear and are absorbed without attracting attention; subconjunctival hemorrhages are as a rule no more significant. Hemorrhages within the orbit are seldom of importance either as primary lesions or as complications of injury. A ruptured sacculated aneurysm will heal spontaneously with the aid of a compression bandage.

Exophthalmic goiter frequently is a most difficult condition to demonstrate and is therefore one of the greatest stumbling blocks to a correct diagnosis of orbital tumor. Exophthalmos is present in only about a third of the cases in which

there is moderate elevation of the metabolic rate; it is frequently a delayed sign of the disease, coming on only after the metabolic rate has receded and after other signs of the disease have disappeared. Exophthalmos may appear as the only sign of toxic goiter, and as it may appear in one eye only, the cause of the exophthalmos may be in doubt. Operation on the orbit under such conditions has been carried out in a number of cases but with negative results. On finding no pathologic changes in the orbit, the condition in such cases has been erroneously classified as "pseudotumor" of the orbit. That name does not apply to such conditions as are found in goiter and should be reserved for a particularly definite pathologic condition which I have described elsewhere. Not many cases of exophthalmic goiter will be missed if the basal metabolic rate of all persons with noninflammatory exophthalmos is determined. An increased metabolic rate is pathognomonic of hyperthyroidism, although a low rate is not sufficient evidence to reject a diagnosis of previous hyperthyroidism. The sequelae of hyperthyroidism, particularly exophthalmos without an increased metabolic rate, must not be overlooked.

I am inclined to believe that, in the past, the condition has in many cases been erroneously looked upon as syphilitic because the proptosis and swelling responded to treatment with iodides. The diagnosis of syphilis in orbital disease has waned, however, as biologic tests for syphilis have become more reliable and as means of recognizing disturbances of the glands of internal secretion have become more widely known. The therapeutic use of iodides has taken on a deeper significance as well. A trial of medical measures, probably combined with the use of irradiation, will bring about satisfactory results in a large number of suspected

cases of orbital tumor and abscess. Only the etiology and true nature of the process will remain in obscurity.

The use of roentgenograms for the diagnosis of orbital tumor is now universal; at least in no case would roentgenography be omitted. The interpretation of roentgenograms, however, requires skill and wide experience. We have all seen the folly of operating solely on the basis of the roentgenographic evidence and we have all felt keen disappointment at the failure of some suspected condition to show up in the roentgenogram. Negative roentgenograms are often dangerously misleading, particularly in cases of meningioma and hemangioma, and a sense of false security may be engendered by a poorly made or misinterpreted roentgenogram. In only one condition do I have complete confidence in the roentgenogram, and that is in osteoma. A diagnosis of osteoma in the face of negative roentgenograms cannot be justified, yet I have known this error to be made many times. The reason for the mistake is obvious. A soft-tissue tumor or a cyst situated anteriorly so that it can be palpated near the rim of the orbital outlet will usually seem to be quite hard, unyielding, immovable, and not tender. The continuity of bone seems quite evident and the tumor seems definitely limited. Such tumors are usually encased in a tight-fitting, tense capsule, and while inside they may be of a soft consistency or even fluid, they are unyielding to pressure and are immovable; this gives the impression that what is felt is a bony tumor. If a roentgenogram fails to show definite bony growth it is not likely that an osteoma is present. Palpation is not trustworthy evidence on which to base a diagnosis of orbital tumor.

What I have considered thus far refers to occult orbital tumors or abscesses. The same general conclusions may be applied

if I should include cysts, mucocoeles, meningocoeles, and pyocoeles. Not only must the presence of any of these pathologic conditions be diagnosed by indirect evidence, but their situation, size, age or duration, and histopathologic nature must be inferred. The clinical picture is a composite one of all the signs and symptoms that can be elicited, viewed in the light of a well-derived history. If the diagnosis is not clearly established, the indications may point to medical treatment, watchful waiting, and consultation, but seldom to surgical exploration. Aspiration may be employed under proper safeguards, but operative interference is justified only on clear-cut evidence of definite pathologic changes or after failure of relief by nonsurgical treatment, and then only under strictly aseptic precautions. So many patients with suspected occult tumor have been entirely relieved by nonsurgical measures, with such little risk of permitting a bad condition to grow worse, that I advise, teach, and practice conservatism in such cases.

As against the occult tumor of the orbit there is the superficial cancer of the eyelids or conjunctiva that invades the orbit by direct extension. In these cases there may be no doubt of the diagnosis, but it may be difficult to determine whether and to what extent the orbit has become involved. Basal-cell cancer of the lid does not metastasize but grows by direct extension, usually toward bone. Originating in the deeper layers of the skin, the malignant growth extends in all directions with sloughing or ulceration only on the surface. As the advancing edge of the rodent ulcer breaks down and the part first affected tends to heal, there is a deeper process that does not break down and heal but continues to send fingerlike projections through the indurated substrata. When bone is reached, extension proceeds rapidly beneath the periosteum, the tumor

becomes fixed, and the situation becomes grave. A fixed or immobile basal-cell epithelioma is a potential orbital tumor and must be dealt with accordingly.

Compared to basal-cell cancers, squamous-cell cancers are doubly dangerous because of their greater malignancy and tendency to metastasize. I have not been impressed by the reputed healing of superficial basal-cell cancers by the application of mild heat or violet rays. Such measures may induce surface healing, and for a time the result may seem satisfactory, but recurrences are the rule. Like an iceberg, about four-fifths of the mass is below the surface, and the deeper cancer cells are not obliterated. Basal-cell carcinomas are of a low grade of malignancy and may lie dormant or grow imperceptibly. They seem to be more formidable when situated near the canthi, and I believe it is because, in these regions, they have easier access to bone. When they do invade the orbit, only extensive exenteration will arrest them.

Another difficult problem in the diagnosis of orbital tumor is presented by the melanomas. I shall not speak of the intraocular melanomas, as their significance is obvious. Pigmented nodules of the lids and lid margins and of the caruncles are mostly benign nevi and comparatively seldom take on malignant characteristics. On the conjunctiva, however, pigmented lesions of any size are abnormal and very frequently they undergo malignant change even after many years of quiescence. Melano-epitheliomas of the conjunctiva grow fairly rapidly and give rise very early to hematogenous metastasis. From a single pigmented spot in the conjunctiva, multiple areas will rapidly arise nearby, being deeply pigmented from the start. The tendency to direct extension into the orbit is almost negligible. Seldom does one see a mass of proliferation come from the conjunctiva; instead,

there will be seen a widespread pigmentation with congestion and thickening of the conjunctiva resembling a low-grade inflammation. There are no lymphatic structures within the orbit and the lymphatics of the lids and conjunctiva drain away from the orbit, which accounts for the low incidence of orbital involvement and the high incidence of metastasis to other parts of the body. At biopsy it is well to bear in mind that local recurrences and remote metastatic lesions of melanomas primary within the eyeball frequently are nonpigmented.

A condition of the orbit characterized by mild swelling of the lids, mild chemosis, and exophthalmos, all slowly progressive without pain or fever, is often-times referred to as "pseudotumor of the orbit." The reasons for the appearance of the signs of intraorbital disease do not become clear, and one is confronted with the necessity of remaining in ignorance of the true condition while watching its progress, or of exploring the orbit. Obviously, paracentesis and aspiration are useless. Biologic tests for syphilis and tuberculosis give negative results, and roentgenograms of the head are negative. Tenderness on palpation may be present or absent, but definite signs of abscess or

tumor are wanting. When the orbit is thoroughly explored, a tumor, or abscess, or cyst is not found. The pathologic report on the tissue removed is "chronic inflammation." The orbit is closed and the condition subsides. Such a history may apply to several of the comparatively rare conditions of the orbit: chronic inflammatory pseudotumor, Mikulicz's disease, lymphoma, vascular tumors, leukemic and pseudoleukemic tumors, the chloromas, and inflammation of tuberculous character.

The chances of obtaining satisfactory information from biopsy would hardly justify the procedure, as only thorough digital exploration would reveal a mass in the posterior third of the orbit. Unless exploration can be thorough and unless adequate surgical correction can be carried out immediately, surgical intervention should not be attempted.

In the absence of corroborating constitutional signs of systemic disease, so long as the etiology of pathologic changes in the orbit remains in doubt I would urge observation under whatever nonsurgical form of treatment would seem to offer the best results until a definite distinction between malignancy and inflammation can be made.

NOTES, CASES, INSTRUMENTS

NEVUS FLAMMEUS AND ARRESTED HYDROPHTHALMOS

WINDSOR S. DAVIES, M.D.
Detroit, Michigan

P. S., aged 42 years, a Lithuanian laborer, came to the North End Clinic on March 14, 1938, complaining of difficulty in obtaining gainful employment due to poor vision in the left eye. He stated that he never remembered having been able to see more than shadows out of his left



Fig. 1 (Davies). Nevus flammeus and arrested hydrophthalmos.

eye and that a birthmark on the left side of his face had always caused him considerable embarrassment. The past history was essentially negative except for the duration of the present complaint. There was no history of epileptiform seizures.

Examination revealed a nevus flammeus involving the nose, upper lip, and cheek, and upper and lower eyelids on the left side, which gradually faded off in the temple region as shown in figure 1. The left eye was divergent about 15 de-

grees as measured in the Priestley-Smith manner. Vision was 20/20 in the right eye and only the perception of light in the left eye. Both the external eye examination and the fundus study were essentially negative on the right side. The left eye was slightly larger than the right. The conjunctiva was definitely involved by the nevus with considerable dilation of the anterior ciliary arteries. About the limbus there was increased vascularity with many fine bulbous enlargements of the vessels. The cornea of the right eye measured 11 mm. in diameter and of the left 13 mm. The anterior chamber and iris were negative. Pupils were equal and active. Fundus examination of the left eye revealed the disc to be oval vertically, markedly atrophic, and with deep glaucomatous cupping. The arteries and veins were small. The macula was negative. Intraocular tension (Schiotz) measured 19 mm. Hg in the right and 20 mm. in the left eye. Prolonged dilation over a period of two weeks with atropine sulphate 1 percent did not increase the tension. Fields were normal in the right eye but were not obtainable in the left due to poor vision. No evidence of angioma of the choroid was seen. Roentgenograms of the skull were negative. The blood Kahn test for syphilis was negative. The physical and neurological examinations were otherwise negative.

This is a case of unilateral nevus flammeus associated with glaucomatous cupping of the disc, atrophy of the optic nerve, increase in size of the cornea and eyeball without increase in intraocular tension. This case, it would seem, could be classified as one of arrested hydrophthalmos.

1633 David Whitney Building.

TREATMENT OF TRACHOMA WITH SULFANILAMIDE

A PRELIMINARY REPORT*

MAX HIRSCHFELDER, M.D.

Harrisburg, Illinois

According to findings of Loe (which were confirmed by Richards**) sulfanilamide effects an arrest of trachoma in about three weeks. Thereafter the improvement is said to continue without further medication. Based on their methods of administration and dosage, the drug was tried on 25 white patients of the Southern Illinois Trachoma Clinics. These patients were selected because they showed signs of "active" trachoma.

Each patient received one-third grain of sulfanilamide a day per pound body weight for a period of one week. In the second week the dose was reduced to one-quarter grain a day per pound body weight. Patients who showed objective or marked subjective symptoms due to toxicity of the drug received a reduced dose, or the medication was interrupted for two to four days.

In order to give a clear picture of the result of the treatment during two weeks' medication and observation, it is necessary to divide the cases into four groups. In the first group were children between 5 and 14 years of age who had no, or only very slight, subjective symptoms and normal vision. Their conjunctiva showed no signs of acute inflammation, but there was dense folliculosis in the fornices. These follicles were distinct, rather prominent, and of equal size. The conjunctiva, especially over the tarsal plate of the upper lid, was not injected and did not show secretion. The pannus in this

group was just developing, or its existence was questionable. These cases, border line cases of follicular catarrh, did *not* show definite improvement after two weeks.

In the second group there were 11 patients classified as "trachoma stage 2-A with succulence." These patients complained of slight photophobia, epiphora, various degrees of blepharospasm, and diminution of vision. Objectively, a velvety conjunctiva with imbedded small follicles was observed. There were various degrees of succulence. The granules were not so prominent and distinct as in the first group. The appearance of the conjunctiva was somewhat muddy and indistinct. There were 2 to 4 millimeters of active pannus in most cases. Cases belonging to this group showed improvement after treatment with sulfanilamide. The most outstanding subjective symptom was a diminution of the epiphora, which was noticed on the second day after beginning medication. A few days later the blepharospasm and the photophobia improved, and the vision, which was usually reduced, ranging from 20/40 to 20/200, improved about two lines on the Snellen chart. Objectively the conjunctiva looked dryer and paler, and the granules decreased in size. The velvety appearance was diminished on the sixth day. On the seventh day the presence of normal blood vessels was observed on the conjunctiva over the tarsal plate of the upper lid, a region which showed the first and most marked signs of objective improvement. The vessels of the pannus became thinner and less distinct on about the tenth day after the treatment was begun. However, they did not disappear during the course of observation. At the end of two weeks the granules in the conjunctiva were still present, but less distinct, the conjunctiva itself was smoother, the velvety appearance was gone. About

*From the Governor Horner Trachoma Clinics of Southern Illinois, Dr. Harry S. Gradle, Director.

**Richards. Personal communication from the U. S. Indian Service to Dr. H. S. Gradle.

75 percent of the patients of this group felt unquestionable improvement in their eyes. Among them is a patient who suffered from an acute flare-up which started two months previous to the sulfanilamide treatment. Another patient had had photophobia for one year, and was without treatment during that period. He improved rapidly within a few days after sulfanilamide medication.

The third group included patients who had trachoma stage 3 without too malignant sequelae due to the disease. Their conjunctiva showed velvety patches and scarring. There was a slight degree of succulence and considerable pannus. Granules in this group were absent. These patients also showed improvement. Their lids looked paler and smoother after a course of two weeks, and the vision improved, due to a slight clearing of the pannus. In this group the sulfanilamide seemed to moderate the course of the disease, and to bring it closer to stage 4.

In the fourth group were three patients who, for the past years, had had very active and malignant forms of trachoma. They had suffered repeatedly from flare-ups, and had vision of less than 20/200, due to marked scarring of the cornea, active pannus, and blepharospasm. They were also classified as stage 3, but the conjunctiva lacked the velvety patches. Instead it was dark red, hypertrophic, and smooth, and the tarsus was very markedly thickened and deformed, due to scars. The blood vessels of the pannus were very thick, and the whole picture was that of a malignant type of trachoma, even though active granules were not present. These patients showed, aside from a very slight paling, only little response to the drug, and their subjective symptoms, as well as the objective findings, did not clearly change.

Many of the patients complained of headaches, dizziness, vertigo, and nausea

after the first doses of sulfanilamide. In most of them the symptoms disappeared after two days. Two older patients had to be taken off the treatment on the second day on account of nausea and vomiting. Three other patients showed signs of cyanosis on the tenth day of treatment, and their treatment with sulfanilamide was discontinued for the rest of the two weeks' period. In one of these three patients the pulse rate went up to 140, but rapidly returned to normal after discontinuance of the drug and administration of digitalis. Three other patients showed slight signs of dermatitis medicamentosa on the forearms and legs on about the tenth day. The subjective symptom of itching and the objective dermatitis disappeared after a short interruption of the treatment. As trachoma is a disease of the more indigent part of the population, it is our impression that one has to be careful with the administration of sulfanilamide, for the general physical condition of these patients is often poor, due to bad living conditions. Medication without very close supervision is inadvisable.

After two weeks of observation and treatment we have the impression that sulfanilamide has a paling and drying effect on the succulent conjunctiva of trachoma stage 2 and milder cases of stage 3. Further, it seems to aid in the healing of pannus in cases that are not too old and not too malignant. Whether it can completely arrest the disease, and prevent recurrences, is a question for future observation.

OCULAR PEMPHIGUS*

FERDINAND L. P. KOCH, M.D.,
Rochester, Minnesota

Chronic ocular pemphigus is an uncommon disease.¹ It is usually associated with

* From The Mayo Foundation.

lesions elsewhere in the skin and mucous membranes. It may be of toxic origin, since changes of the pemphigus type are occasionally found in certain other toxic dermatoses; Welsh,² however, was able to demonstrate a characteristic streptococcus in the blood and nasopharynxes of seven patients with clinical evidence of the disease.

The formation of blisters or bullae in the conjunctiva is followed by submucous invasion by newly formed connective tissue with subsequent cicatrization. Total ankyloblepharon and obliteration of the cul-de-sacs, together with ultimate corneal involvement, eventuate in the condition known as "essential shrinkage of the conjunctiva." The symptoms are very distressing. Secondary infection of the chronic conjunctivitis produces a mucopurulent infection, although remissions may occur. Discomfort becomes permanent as exposure and dryness supervene, and marked photophobia follows the secondary corneal involvement.

The diagnosis in the early stages depends upon recognition of the characteristic bullae, erythematous scaly patches, and early cicatrization in both the skin and mucous membranes. Tenderness of the mouth and throat often are the first manifestations of the disease for which the patient seeks relief.³ The lesions in the conjunctiva must be differentiated from those of erythema multiforme, dermatitis herpetiformis, and from bullous syphilides.

Caro⁴ has recently reported encouraging results in the treatment of dermatologic pemphigus following the administration of sulfanilamide. However, since adequate methods of treating the condition are at present unknown, the prognosis is always bad and, should the patient survive, eventual blindness will ensue.

REPORT OF A CASE

A white man, an electrician, aged 54 years, of English-Irish-Canadian descent, registered at the clinic on April 25, 1938. He complained of having had difficulty with his eyes for the preceding two years, during which period he had observed a slowly progressive, painless reddening of the sclerae. Bilateral and gradual diminution of vision had existed since December, 1937. Coincident with this there had been a slow thickening of each lower lid, the lids gradually having become adherent to the lower portion of each globe. At this time an attempt had been made to improve the refractive correction but this had been unsuccessful. Local treatment had then been instituted, consisting of palliative collyrium and ointments, but this had resulted in increased smarting and burning and in occasional photophobia. Four subcutaneous injections of a substance (which was probably pituitary extract) had been administered but without effect. An occasional reddened area along the gum line below the lower front teeth had begun to appear toward the latter part of the first year. The patient described this as a "bubbling up" of the tissue. Tenderness of the mouth and cheeks and slight soreness of the throat on swallowing ingested material had manifested themselves at the end of this year. As the patient's teeth had never been in good condition he had requested that they be extracted. An upper plate, fitted about a year prior to his admission, had been worn comfortably. Four months prior to admission the lower teeth had been extracted and, as the gums had continued to remain raw and tender, a plate was not furnished. Cutaneous lesions had never been observed at any time. The patient denied having had venereal disease, and the only factor relevant to his illness was a history of duodenal ulcer.

General examination at the clinic revealed a low-grade, chronic tonsillitis, duodenal ulcer (confirmed by roentgenography), mild hypertrophy of the prostate gland, and small internal and external hemorrhoids. Examination of the mouth revealed an almost continuous, grayish-red, irregular patch along the entire upper surface of the lower alveolar ridge which continued laterally over the postero-inferior aspect of the left cheek. One small, clear, intact bulla was seen on the anterosuperior surface of the alveolar process over the site of the first right incisor tooth. Another characteristic bulla was observed in the upper portion of the right pyriform fossa. No lesions were observed over the hard or soft palate or on the lips or skin. All laboratory tests gave essentially negative results.

Ophthalmologic examination revealed the vision in the right eye to be 6/15, with correction, and in the left eye 6/20, with correction. Near vision had been reduced to the ability to read 14/35 (American Medical Association rating) with each eye, with correction. No improvement was obtained on subsequent refraction tests. The lid of each eye opened and closed normally and the margins approximated well without distortion. The palpebral fissures were equal and normal in appearance. Adequate drainage of tears was accomplished by way of the normal punctum and canaliculus of each upper lid. The skin surface of each lower lid presented a slight, brawny induration which was most marked at the margin; the cilia, however, were normally placed. The lower conjunctival fornix of each eye was approximately equally foreshortened to only a third of its normal extent. The partial obliteration by irregular thickening of each cul-de-sac had been accomplished by submucous cicatrization of both the palpebral and bulbar conjunctival sur-

faces. This involved the entire inferior half of each eye and extended from just above the horizontal axis temporally, sweeping across below the cornea to involve almost the entire area exposed by the palpebral fissure over the inner canthus. The erythematous and thickened palpebral and bulbar conjunctiva presented a moderately uneven surface which was studded with irregularly rounded and elongated, slightly elevated, glistening gray patches. Two small, characteristic, red bullae, typical of ocular pemphigus, were observed in the middle third of the right lower lid near the palpebral-ciliary margin. These were 2 mm. in width, 1 mm. in height, and 4 mm. in length, and they ruptured in a few hours. No bullae were ever observed in the left eye. The lower puncta had been involved in the process and, anatomically, no longer existed. Adhesions between the palpebral and bulbar surfaces already had appeared and were more manifest temporally and nasally than centrally; however, those occupying the inner canthal area of each were rather prominent (fig. 1). The external ocular movements were definitely and equally, but only moderately, limited in all the cardinal fields of action except for apparent unimpairment on horizontal and downward convergence.

The remainder of the examination gave essentially negative results. The corneas showed no manifest pathologic changes; the anterior chambers were of normal depth; the tension with the Schiötz tonometer was 11 and 13 mm. of mercury in the right and left eyes, respectively; the irides were normal in appearance and function, the pupillary reactions to the usual stimuli being satisfactorily performed, and the lenses and the vitreous bodies were clear. The ophthalmoscopic findings were essentially negative, as were also the corneal microscopic observations.



Fig. 1 (Koch). Bilateral pemphigus of conjunctiva, showing foreshortening of mucous membrane, partial obliteration of lower cul-de-sacs, and symblepharon of the internal and external canthi.

The rough fields were negative. The laboratory findings were also essentially negative, no parasites, unusual bacteria, nor an eosinophilia having been demonstrated.

Local treatment was instituted immediately following ocular examination on the day of registration. This consisted chiefly of irrigations with 2-percent boric-acid solution followed by 0.5-percent pontocaine drops. Vitamin A (10,000 units per gram) ointment in a light base was placed in both fornices of each eye. This routine was followed daily during the three weeks the patient was under observation. Epithelization of the lesions was characteristic of the moderate improvement observed. The conjunctival surfaces became somewhat smoother, the grayish patches became smaller and fewer in number, and the subjective symptoms of which the patient complained no longer manifested themselves. Distance vision improved with correction in the right eye to 6/12, and in the left eye to 6/15, and it became possible for the patient to read 14/24.5 (American Medical Association rating) with both eyes, with correction.

Upon the use of a mild sodium-borate mouth-wash three times daily the lesions in the mouth followed the same general course as those in the eyes. The bulla in the right pyriform fossa was replaced by a steadily diminishing grayish patch.

The patient was not hospitalized, general treatment consisting solely of the administration of sulfanilamide to the point of tolerance. This was begun on the day of registration. Two tablets of 5 grains (0.3 gm.) each were given orally three times daily for seven days until vague nausea and continued vertex headaches appeared. After this the dosage was reduced by one half for two days, when the original dosage was resumed. The dosage was then increased to a total daily ingestion of 60 grains (3.88 gm.) and this was continued to the day of dismissal three weeks after the patient's appearance for examination. A more intensive course of treatment was not advised because of the doubtful benefit to be derived.^{1, 3} The patient was dismissed for continuation of the treatment at home under the care of his family physician.

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SCLEROTOMY SCISSORS FOR ENLARGING CORNEAL INCISIONS*†

CONRAD BERENS, M.D.

New York

These scissors were constructed because of the need of a pair of strong scissors with long curved blades with which to make sections in the corneo-scleral junction. The usual procedure is to make this incision with a Stevens scissors, but this has been found to be awkward.



Fig. 1 (Berens). Sclerotomy scissors for enlarging corneal incisions.

Description. These scissors (fig. 1) have spring shafts, 90 mm. in length, at one end of which are curved blades. At the other end is a screw joining the two ends of the spring. The blades, which are 11 mm. in length, are slightly curved. The upper and lower blades are blunt and the lower blade ends in a probe point.

These scissors are made in two models: one for incisions to the right and one for incisions toward the left. However, one

scissors may suffice by directing the handle downward when cutting to the right and holding the handle upward when cutting to the left.

Use of the scissors. The scissors have been found particularly useful in enlarging cataract sections and for opening iridosclerectomy and iridocorneosclerectomy wounds for glaucoma when the wound has ceased to filter. The scissors are also useful in completing the circumcorneal conjunctival incision in enucleation of the eyeball and in performing other operations on the conjunctiva.

35 East Seventieth Street.

A CHART FOR TESTING VISUAL ACUITY AND ASTIGMATISM*

CONRAD BERENS, M.D.

New York

AND

S. JUDD BEACH, M.D.

Portland, Maine

This test chart is an attempt to combine the several different functions for which such charts are used. It furnishes a test of the visual acuity, adapted to young and old patients, with the different mentalities. It also furnishes a means for estimating the refraction, giving information of more than usual accuracy with regard to the amount and axis of the astigmatism.

* Made by V. Mueller and Company, Chicago, Illinois.

† Aided by a grant from the Ophthalmological Foundation, Inc.

* Aided by a grant from the Ophthalmological Foundation, Inc.

The special features that this chart (fig. 1) possesses are that (1) visual acuity may be accurately tested in children and in illiterate patients by the use of the E test, (2) for other patients and to verify the E test, the international broken ring may be used, (3) the ZN's and crosses** are useful for determining the astigmatism, and (4) usual test letters are also furnished to test both visual acuity and refraction in the conventional way.

The numbers at the side of the chart parallel with each line of figures conserve the examiner's time in designating the line to be read.

35 East Seventieth Street.

704 Congress Street.

** Beach, S. J., The selection of test type for refraction Trans. Sect. Ophth., Amer. Med. Assoc., 1927.

A NEW PRISM BAR*†

CONRAD BERENS, M.D.

For several years we have been using racks of glass prisms** numbered from 1^a to 50^a for performing the screen test to measure heterophoria or heterotropia rapidly in prism diopters. They have also been used for giving prism converging, diverging, and supraverging exercises. Although these racks save much time they have a number of disadvantages. The cost is prohibitive and the prisms are easily chipped and scratched. Furthermore, the glass prism racks are heavy and cumbersome to use. Therefore, for the past few years we have experimented with various

* Aided by a grant from the Ophthalmological Foundation, Inc.

† Constructed by R. O. Gulden, Philadelphia, Pennsylvania.

** Berens, C. Present ophthalmologic standards for commercial aviation in the United States. Jour. Aviation Med., 1932, v. 3, June, p. 55.

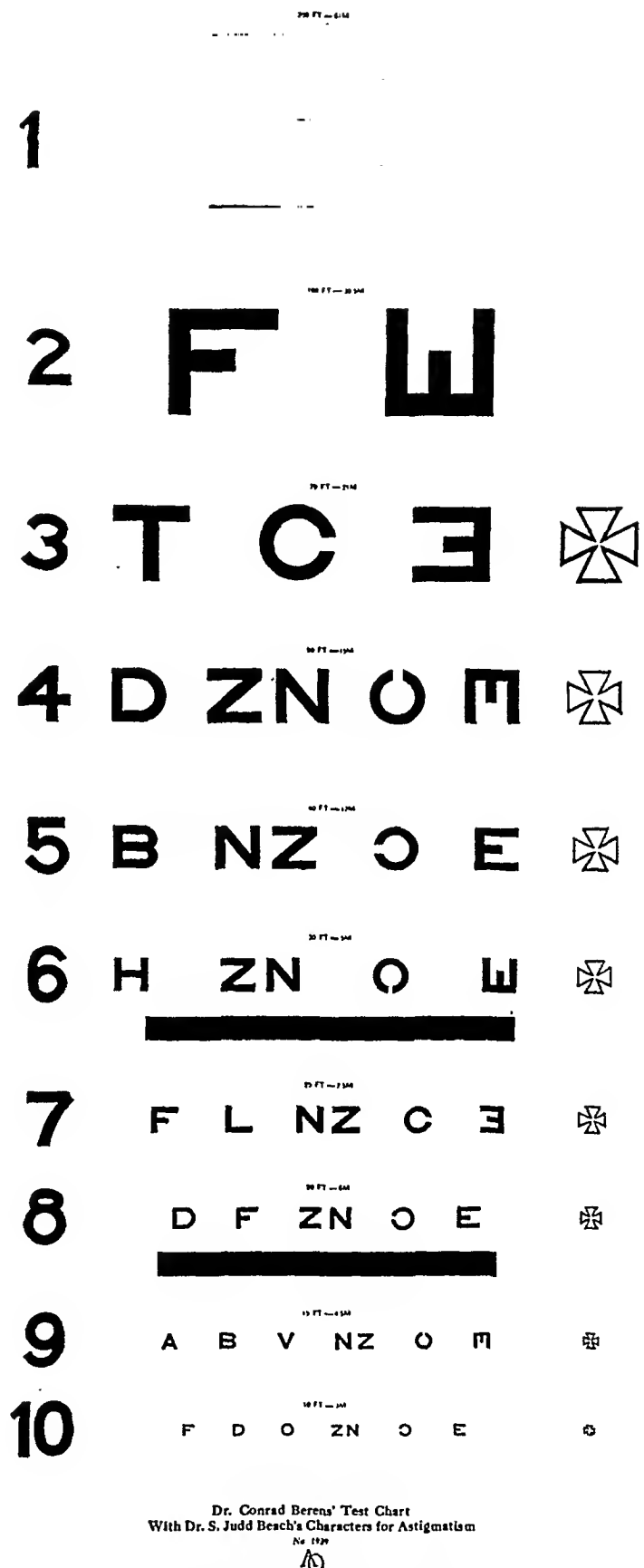


Fig. 1 (Berens and Beach). A chart for testing visual acuity and astigmatism.

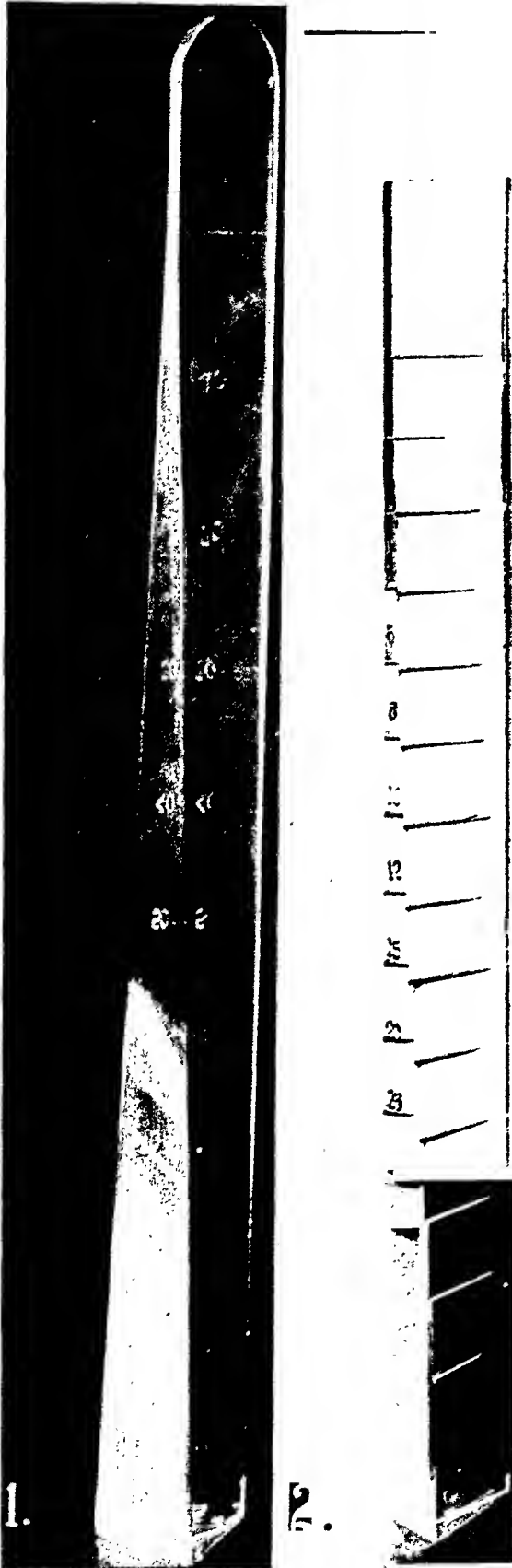


Fig. 1 (Berens). Prism rod with 100^d prism at the thick end.

Fig. 2 (Berens). A new prism bar.

substitutes for glass which have similar indices of refraction to glass and have studied the question of molded prism bars made of glass and substitutes for glass. The molds would be unnecessarily expensive and the finished products could not be guaranteed.

Prism bars, made of transparent material and filled with water and other fluids, were constructed but were not satisfactory. Finally a solid substitute for glass was ground and polished into a long rod with a 100^d prism at the thick end (fig. 1). It was a disappointment to find that the vertical prism produced by the diverging sides made the rack inaccurate and practically useless.

The prism bar illustrated in figure 2 was finally constructed. It is 12 inches in length, containing prisms from 1^d to 50^d. At the ends of this bar there are ground extensions which may be used as handles and for performing the screen test.

The bar, which is made of one piece of material with an index of refraction of 1.52, is numbered in prism diopters from 1^d to 50^d on the surface made by the base of the prisms.

Advantages. The advantages claimed for this bar are: (1) it is less expensive than glass prism racks; (2) its lightness makes it much easier to handle, especially in performing the screen test when it is necessary to superimpose square prisms; (3) the material is colorless, difficult to break or chip, and apparently more transparent than glass; (4) if the surface becomes slightly scratched it may be easily repolished; (5) the material used produces a more pleasant sensation than glass or metal when in contact with the skin; (6) this prism bar does not seem to show finger marks so readily as glass and is more easily cleaned than the racks in metal frames.

35 East Seventieth Street.

SOCIETY PROCEEDINGS

Edited by DR. H. ROMMEL HILDRETH

NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

December 21, 1937

DR. EDWIN B. GOODALL, *presiding*

THE PRODUCTION OF TRANSITORY OPACITIES OF THE LENS IN RODENTS

DR. CAROLINE TUM SUDEN said that in mice, after a single intraperitoneal injection of adrenalin (0.5 mg. to 0.76 mg. per 100 gm. body weight) rapid clouding of the lens occurred in approximately one half of the test animals and disappeared within two to three hours after onset. In rats, which are twice as susceptible to the fatal effects of adrenalin as mice, formation of lens opacities with survival was rare. However, in the latter species, administration of adrenalin (0.3 mg. to 0.5 mg., per 100 gm. body weight), superimposed upon a moderate degree of histamine shock or adrenal insufficiency, produced lens opacities in 57 to 85 percent of the rats, one third of which survived with complete loss of the opacity. Similarly in mice, histamine increased the incidence of opacity formation from 50 to 90 percent and decreased the mortality rate from 15 to 7 percent.

The phenomenon was not correlated with a systemic rise in blood pressure but occurred during the period of marked hyperglycemia following the injection of adrenalin, as Collevati had previously determined in experimental animals.

FACTORS INFLUENCING THE INCIDENCE OF GALACTOSE CATARACT IN RATS

DR. HELEN S. MITCHELL said that the rat has proved to be a suitable animal for use for research on cataract because in this species opacities of the lens may develop as a result of certain nutritional disturbances, while spontaneous cataract is

rare. The discovery that cataract would occur in rats fed on high levels of lactose was made in the Battle Creek laboratory in 1933 and first reported to the American Society of Biological Chemists in the spring of 1934. Control experiments with other carbohydrates, starch, dextrine, maltose, sucrose, and glucose, were entirely negative. Thus galactose, a fraction of the lactose molecule, proved to be the cataract-producing agent in lactose. Dr. Yudkin as well as other workers have repeatedly confirmed these findings.

Galactose cataract resulting from the feeding of either lactose or galactose should be distinguished from vitamin-G-deficiency cataract. Both may be considered nutritional.

A variation in the susceptibility of different strains of rats to galactose cataract and a lesser but significant variation between litters are observations which have proved to be of increasing importance in the study and interpretation of accumulated data.

Studies of the sugar contents of the blood and urine of rats on cataract-producing rations have demonstrated that galactose is the sugar responsible for the high sugar contents of both blood and urine, and that it must be the major etiological factor in this type of cataract.

One dietary factor that seems to alter the rate of development and the incidence of galactose cataract is protein. A low-protein ration (5 percent) appreciably hastens the development of opacities of the lens, and a high-protein ration tends to retard this pathologic change. Other factors, including moderate excess or deficiency of relevant vitamins, have failed to alter the cataract-producing action of galactose.

The earliest lenticular change in rapidly developing cataract is a dense vacuolated film originating at the equator and extending over a large portion of the anterior cortex of the lens, the film later disintegrating as large vacuoles and disappearing before visible opacities develop.

Regression from the stage of complete opacity to that of the nuclear stage has been observed in a large proportion of these experimental animals, but no specific dietary factor nor local medicament has seemed to alter the speed or extent of this regressive change. The age of the animal and the extent of the injury, however, do seem to influence the change.

There is no reason to believe that there is any immediate clinical application or significance in these findings, but the possibility of experimental production of opacities of the lens under carefully controlled conditions permits a new approach to a baffling subject. As a result of these studies numerous problems of a fundamental nature have arisen and warrant further investigation.

DIET AND VITAMINS IN RELATION TO CATARACT

DR. ARTHUR M. YUDKIN said as a result of the knowledge that a cataract is an opaque condition of the lens, many attempts were made to reverse the processes by treating the eye locally and systemically. Because of the poor results following surgical treatment, many of the earlier ophthalmologists were more inclined to treat the condition with nonsurgical methods. With the advent of better surgical technique and local anesthesia, however, the ophthalmologist looked forward to removing the opaque lens by surgical means. Dr. Yudkin believes that every practicing ophthalmologist is satisfied that cataract formation is not due to a single factor but is produced by many conditions. Outstanding among these causes

may be considered a disturbance of the general metabolism of the individual, with a subsequent local change in the eye. Although arteriosclerosis has never been definitely considered as a cause for cataract, it is Dr. Yudkin's belief that it must play a significant role in this respect. In view of the present knowledge of human nutrition it is advisable that all elderly patients having any signs of early changes in the lens be instructed how to live properly. Dr. Yudkin found that by taking a teaspoonful of potent yeast powder twice a day and the juice of at least two lemons daily before meals, tumescence of the lens was decreased and the tissue returned to normal, but when striae were produced by changes in the lens, no improvement was noted. The diminished vision of many of these patients was improved by this therapy, whereas a number remained the same over a period of five years. Dr. Yudkin further believes that we have a right to treat patients with a well-balanced diet supplemented by the vitamins in order to check and prevent this condition.

ATOPIC CATARACTS

DR. WILLIAM P. BEETHAM presented a paper briefly summarizing the relationship of cataract and dermatitis. The data on eight patients with cataracts and atopic dermatitis, hay fever, and asthma were reported, making approximately 40 such cases in the literature to date. Two types of lens changes were observed; one of the usual cataracta complicata type, and one in which a plaque of opacity in the anterior cortex was the dominant feature. A cataract of the latter type was removed intracapsularly and studied histologically. Aqueous was aspirated from two patients and injected intracutaneously with no sensitivity response. The author discussed the role of infection, avitaminosis, endocrine-gland deficiency, autonomic nervous-system disturbances, and allergy. Dr.

Beetham concluded that some unexplained allergic phenomenon was responsible. The term "atopic cataracts" was used to define and classify this association.

Virgil G. Casten,
Recorder.

NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

January 18, 1938

DR. EDWIN B. GOODALL, *presiding*

PRESENT STATUS OF ORTHOPTIC TRAINING

DR. EDWIN B. DUNPHY said that during the past two years he had tried orthoptic training on 29 patients with concomitant convergent strabismus. Nineteen of these (65 percent) were greatly improved in that their angle of squint was markedly reduced, so that they were able to go without glasses and maintain the visual axes approximately parallel. However, of these 19 patients, only 7 (or 24 percent of the total number) obtained a complete cure in that they had absolute binocular fixation as well as the ability to solve depth-perception charts. At the beginning of the training period all 19 had good binocular vision when slides were presented to them at their angle of squint.

Before training, these 19 cases were all of the accommodative type of strabismus in that the squint was markedly lessened by the wearing of plus lenses, so that in no case was the angle of squint more than 10 arc degrees while glasses were worn. When the glasses were removed, however, the squint increased markedly. After training, the patients were able to remove their glasses without experiencing any return of the squint, and the angle of deviation had been reduced to zero or a negligible amount. The average number of treatments for this group was 29.

Of the 10 failures only three were in cases of the accommodative type, in the

other seven there was a refractive error of less than plus two diopters. In these seven the fusion sense was poor to begin with and never developed to any extent during the period of training. Cases of abnormal correspondence were not selected for training. An average of 13 treatments was given to the members of this group before the case was given up.

Dr. Dunphy said that the question will arise as to how much good orthoptic training really does. We all know of certain patients with squint who, after a period of wearing glasses, become so much better that years later glasses are discarded and there is no return of the squint.

Guibor in 1934 reported a series of 38 cases of internal squint treated by orthoptics. Fusion developed in 99 percent and correction of the squint was obtained in 50 percent. A control series of 40 cases was treated by glasses alone. In this control series fusion developed in 20 percent and complete correction developed in 7 percent. Dr. Dunphy believes this the only controlled series reported in this country, although English and French writers report more or less the same results in their controlled series.

In concluding Dr. Dunphy said that such a small series as his probably would have little value. However, it seems to him that orthoptic training is probably of value in a small group of squint patients who have normal retinal correspondence and well-developed binocular vision when tested on the synoptoscope, and whose angle of squint is not more than 10 degrees when wearing glasses.

Just how orthoptic training works he does not exactly know. It certainly does not create binocular vision when this function is absent. It may, however, improve the patient's appreciation of it so that the desire to use it is stimulated during the exercise period to such an extent that the visual axes tend more toward

parallelism in the effort to maintain it. In other words the duction power is increased.

CONCERNING ANOMALOUS PROJECTION
AND OTHER VISUAL PHENOMENA ASSO-
CIATED WITH STRABISMUS .

DR. FREDERICK H. VERHOEFF read an interesting paper on this subject.

Virgil G. Casten,
Recorder.

CHICAGO OPHTHALMOLOGICAL
SOCIETY

March 21, 1938

DR. THOMAS D. ALLEN, *president*

MERCURY GLOBULE IN ANTERIOR CHAMBER

DR. WILLIAM H. DROEGEMUELLER presented a man, aged 26 years, who had suffered a corneal laceration with iris prolapse of the left eye from the glass of a broken neon sign in October, 1937. When examined, a small metallic globule was noticed in the anterior chamber, which was thought to be mercury: the presence of mercury in the neon tube was confirmed.

Operation consisted of the excision of the prolapsed iris and a sliding conjunctival flap, bridge type. The lens was not injured. An attempt was made to scoop up the globule with a small curette but because of the absence of the anterior chamber and the danger of injury to the lens this was not feasible. The postoperative course was uneventful. A roentgenogram revealed, instead of the single globule of mercury seen at the time of operation, several small particles of radio opaque material below and at the site of the laceration. There were three small metallic globules lying on the zonule of the lens.

For one month following the injury there was a mild inflammatory reaction. Cells persisted in the anterior chamber, and a few large gray-white K.P. The eye cleared, and the corrected vision was

20/20. After the second month, however, attacks of mild inflammation and corneal epithelial edema developed. This was more marked from below. A few deep vessels were noticed in the corneal stroma. The tension remained normal. The patient was treated with sodium thiosulphate intravenously, following the procedure used by dermatologists in the treatment of mercurial irritation from mercurial rubs. Under this management the condition did not progress, although the definite value of the drug may be subject to question. The present corrected vision is 20/30 but it has been as low as 20/70.

RETINITIS PROLIFERANS: A CLINICAL AND
HISTOLOGIC STUDY

DR. BERTHA KLIEN discussed the pathogenesis of two different types of retinitis proliferans. The clinical and histologic characteristics of each type were described and illustrated.

Discussion. Dr. William F. Moncreiff said that the classification of retinitis proliferans into two varieties, from the standpoint of pathogenesis which Dr. Klien proposed, was of basic importance from the anatomic standpoint, and has been correlated by the essayist very strikingly and accurately with the clinical (ophthalmoscopic) findings. This concept has apparently not appeared in the literature. For those whose most immediate interest is in the therapeutic application of clinical and pathologic data, this contribution might also have some significance. While in either type the effort should be to combat the primary disease in advance of the development of retinitis proliferans, or in its earliest stages by way of prophylaxis, one might also be guided in direct therapy of the differing pathogenesis of the two forms of the retinal lesion.

In type 1 the effort should be directed toward promoting the rapid absorption of the exudates or hemorrhages by foreign protein and other intravenous therapy

and by the use of heat, employing especially the newer methods. In type 2, these methods would be expected *a priori* to be relatively ineffective, and the underlying vascular disease must be combated. In most cases the results would be disappointing except in some syphilitic cases and possibly a few diabetic cases. In the treatment of the vascular disease of hypertension, especially, sodium hyposulphate in the form of sulfactol might be found worthy of further trial.

Dr. Robert von der Heydt congratulated Dr. Klien particularly on her artistic and beautiful fundus drawings. He asked about the possible inclusion of congenital cases of massive glial proliferation. These are sometimes hemorrhagic in origin.

Dr. Bertha Klien said the first type is much more apt to lead to retinal detachment than the second, because of the large amount of connective tissue, which has a tendency to shrink with age. The second type, being more vascular, does not shrink so much, and its origin at the nerve head prevents early traction on the retina.

In answer to Dr. Goldenburg, she said that this subject had not been investigated from the hematologic point of view. Possibly alteration of the blood itself, as in polycythemia vera, which occasionally is known to cause an occlusion of the central retinal vein or its branches, might lead to vascular anastomosis and thus to the second type of retinitis proliferans.

Robert von der Heydt.

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

SECTION ON OPHTHALMOLOGY

March 11, 1938

DR. WALTER CAMP, *president*

HEADACHES OF OCULAR ORIGIN

DR. A. D. RUEDEMANN of Cleveland gave a talk on this subject.

Discussion. Dr. A. D. Prangen said it is important to see that the patient has a thorough physical, and possibly a neurological, examination in a search for all the possible factors which might be causing the headaches. In cases of chronic headache of doubtful origin it seems best that some one consultant be made a sort of clearing house for all the clinical data and that he make an attempt to put the various component parts of the clinical picture together in an attempt to establish a diagnosis.

Dr. A. D. Ruedemann in answering Dr. Fink regarding children and their headaches said the child himself must be considered. He may belong to a social group in which headaches are common or he may come from more or less inferior stock. Such a child comes in contact with normal individuals and is expected by his parents to carry on as a normal child. We must remember that headache is foreign to the child as he starts out in life and someone must impart to him the idea of headache.

George E. McGeary,
Secretary.

COLLEGE OF PHYSICIANS OF PHILADELPHIA

SECTION ON OPHTHALMOLOGY

March, 1938

DR. ALEXANDER G. FEWELL, *chairman*
THE USE OF PAREDRIE IN CYCLOPLEGIA

DR. I. S. TASSMAN read a paper on this subject which was published in this Journal (August, 1938).

Discussion. Dr. Sidney L. Olsho said that in his office homatropine-refraction cases he has heretofore employed ten instillations at ten-minute intervals. The frequency was to make certain of a thoroughly reliable cycloplegic effect. As recommended by Beach, he had, during the past several weeks, instilled one drop in

each eye at five-minute intervals of the following: 5-percent homatropine solution, 1-percent benzedrine solution, 5-percent homatropine solution. He then waits one hour for the cycloplegic effect. To avoid having the drop squeezed out he has the patient look down, the upper lid is held up and the drop is allowed to flow over the eyeball from an insensitive point well above the cornea. Before it can be squeezed out it has mixed with the tears. The second drop of homatropine might have been omitted, but he was not making an experimental study and was employing the method for effect.

In most instances patients were able to use the eyes for close work on the following day. Postmydriatic examinations are in his opinion advisable.

The cycloplegic effect seemed to him perfectly satisfactory in the new cases. The postmydriatic reduction from the total hyperopia corresponded to that made after thorough homatropinization. In those which were reexamination cases, the mydriatic and postmydriatic results seemed also to correspond to his expectations following the homatropine method.

VERTICAL-PRISM VALUES IN COMMONLY USED BIFOCALS

DR. SIDNEY L. OLSHO said bifocal additions or "adds" are convex and spherical. The intended add is always generated in the form of a circle. In grinding standard adds the optical centers are not established in the centers of the segments but in the centers of the circles of origin. When the add becomes a bifocal-component, only a part or a segment of the circle is used.

The accepted theoretical reading point is 4 mm. below the segment's upper margin. By the Prentice rule we can find the separate vertical-prism effect of the segment at the reading point. To obtain this, multiply the diopter power of the add by

the distance in centimeters of the reading point to the center of the circle of origin. The product equals in prism diopters the vertical-prism effect of the segment at the reading point.

Closely allied bifocals have been given diverse names for commercial motives and also to distinguish high grades from inferior qualities.

Certain bifocals are advertised directly to the wearer, who is obviously not qualified to select the most suitable type.

A meticulous correction of the distance vision, with careful attention to small cylinders and their axes, the certainty that all of the manifest hyperopia is corrected and that a myopia is not over-corrected effect the following advantages: they make a less high addition adequate, therefore less difference between the distance and the near corrections and hence less accommodative and adjustive change for the eyes. In any bifocal the lower the power of the add the less there is of chromatic and marginal aberration.

All modern bifocals are composite lenses. The segment is not an independent unit. The upper or main lens serves as a carrier of the segment. An infracentral, therefore, an excentric area of the main lens becomes an integral part of the composite reading portion. Accordingly the main lens introduces an inescapable prismatic effect in the reading part. If the eye be directed several millimeters below the optical center of a lens of convex power to an infracentral point, which we will call the reading point, it encounters a prism base up. At the reading point of a concave lens the prism is base down.

For practical purposes of the prescriber it will suffice to study the excentric prismatic values in prism diopters downward along the 90-degree meridian. Values so obtained are not precise for points somewhat lateral to this principal meridian.

The prism values are obtained by ap-

plication of the Prentice principle after the vertical effective powers of the lenses have been determined. Spherical lenses are vertically effective 100 percent; cylinder lenses at axis 180° are vertically effective 100 percent; cylinder lenses at axis 90° are vertically effective nil; cylinder lenses at axis 45° and 135° are vertically effective 50 percent. Compute the net vertical effective power of the cylinder and add all of the sphere for total effective power.

To obtain the vertical prism diopters, base up, for plus, or base down, for minus, unavoidably introduced by each of the distance corrections at each of the theoretical reading points (.8 cm. down from optical centers), multiply the total vertical effective power, plus or minus, of each distance correction by .8.

Dropping below the optical centers of distance corrections of unequal vertical effective powers, the eyes encounter progressively increasing vertical-prism disparity.

To ascertain the vertical-prism imbalance at the theoretical reading points, carefully compare the right and left products.

Trouble involving costs, discomfort, and reproach may be forestalled if the prescriber of bifocals will ask himself; (1) in bifocals made on this prescription will there be, within the natural reading zones, two corresponding points at which the vertical-prism imbalance will be less than one prism diopter? If so, they may be tolerated. (2) Will the vertical-prism imbalance at two natural reading points exceed two prism diopters? If so, prolonged fusion at the near point will be very difficult, if it be possible.

Standard segments of equal powers and size do not alter a disparity. Uncorrected vertical-prism imbalance may be sufficient to make bifocals unwearable. If a hyperphoria be present, a vertical-prism imbalance in the lenses establishes in the

reading zone a dominance either of the appropriate or of an adverse prism effect. This must be foreseen by the refractonist.

A hyperphoria may be too little to require any help when vision is directed through the central or equatorial zones. Analysis may furthermore disclose in the infracentric reading zones of the lenses, a vertical-prism imbalance appropriate for the existent hyperphoria. In this case no vertical prism is prescribed in the upper lenses.

On the other hand, lens analysis may disclose in the reading zones a vertical-prism imbalance incompatible with the existent hyperphoria, the reading-zone prism being base up or base down on the wrong eye. In this case the burden is lightened all around by prescribing in the upper lenses for all of the hyperphoria.

OBLITERATION OF PERICORNEAL BLOOD VESSELS FOR VARIOUS TYPES OF KERATITIS—FURTHER OBSERVATIONS

DR. TRYGVE GUNDERSEN said a carefully selected, but consecutive, series of 35 cases has been studied. These comprise a group of patients with chronic corneal disease which resisted the usual forms of treatment. The types of keratitis were grouped as follows: chronic dendritic keratitis, 6; ocular rosacea, 7; tuberculous keratitis, 12; keratitis from trauma, 2; lipin interstitial keratitis, 2; trachoma, 5; hypopyon ulcer, 1; unclassified, 1.

Obliteration of vessels was usually performed with a sharp needle attached to the diathermy unit. In a few instances, cutting instruments were used.

Some cases have been followed for almost five years. The results obtained have been classified into 4 groups: excellent, 12; good, 9; fair, 9; unimproved, 6.

W. S. Reese,
Clerk.

AMERICAN JOURNAL OF OPHTHALMOLOGY

Published Monthly by the Ophthalmic Publishing Company

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NEW DRUGS FOR THE TREATMENT OF GLAUCOMA

It is generally conceded that when well-established simple glaucoma occurs in clinic patients surgery is indicated because of the impracticability of follow-up. Whether this is true in private practice or not is less clear. Certainly there are many cases in which the doctor will choose drug therapy for one reason or another, and even if surgery has been the choice, it is not infrequently necessary to supplement partial success with drugs.

Until a few years ago the only known medication was pilocarpine and eserine, and these are not always satisfactory, being sometimes too irritating and sometimes ineffective. A valuable recent addition to therapy was concentrated adrena-

lin, especially in the form of two-percent suprararenin bitartrate. None of these, however, is perfect; a constant lookout should therefore be maintained for other drugs.

In this issue of the Journal appears a paper on the use of two new therapeutic agents, mecholyl and prostigmine. The former is suggested for acute and congestive types of glaucoma while the latter is advocated for chronic simple glaucoma.

Mecholyl, a form of acetylcholine, is to be used either by instillation or retrobulbar injection. Like all acetylcholine products it acts as a vasodilator of capillaries, and presumably its favorable action on the eye is by elimination of waste or other abnormal products by the increased flow through the enlarged vascular bed. This is supposed to be similar to the

method of action of adrenalin after the primary constriction is over. Mecholyl must—like suprarenin—be administered cautiously; not like adrenalin because of danger both locally and systemically, but only because of the systemic reaction and possible heart stoppage. This is true especially when injected in cases of asthma or bronchial allergy, and the administrator is warned to have atropine always ready for injection should the drug act alarmingly; not exactly a pleasant thought. However, the drug is reported efficacious where other local treatment has failed and is therefore worthy of a trial.

Equally important may be the second drug described; namely, prostigmine. This, according to the author, is more potent than pilocarpine and eserine in chronic simple glaucoma in that it is effectual where these have failed. Furthermore it seems to act well in combination with mecholyl.

The need for additional armamentaria for the control of glaucoma is so urgent that these promising drugs should certainly be given a trial. But even the best drugs provide only symptomatic treatment and the study of the fundamental glaucomatous condition must be continued unremittingly because this disease of middle and late life obviously is becoming more frequent as the life span lengthens.

Lawrence T. Post.

SULFANILAMIDE FOR TRACHOMA

This drug, sometimes called prontosil album, or white prontosil, has come into prominence as a remedy to combat various diseases. Infections due to streptococcus of different varieties, pneumococcus, staphylococcus and gonococcus, are all indications for its use. Reports on its beneficial effects now occupy an impor-

tant place in current medical literature. It seems to have a wide and important antibacterial action within the body. Whether trachoma is caused by bacteria, or whether it is due to a virus, may not be settled; but sulfanilamide has been used for trachoma with rather striking benefit. In our lack of knowledge of the cause and pathology of trachoma, it is worthy of trial.

At the San Francisco meeting of the Section on Ophthalmology of the American Medical Association, some of those present testified to the beneficial influence it seems to exert in trachoma. Favorable reports have been received of its use for trachoma among the Indians in different parts of this country. Since hearing of it, several ophthalmologists have tried the drug on trachoma patients and found it beneficial. Its efficacy has been especially apparent in the checking and clearing up of corneal lesions.

In the *Lancet* for October 29th, Dr. Kirk, of Khartoum, Africa, and two colleagues give their experience with sulfanilamide in 25 cases of trachoma among the natives of Central Africa. In all the cases but one there was improvement of the eye conditions. In three cases with less than one month of previous treatment there was rapid improvement in two and slower improvement in the third. Among eight cases that had previously been under treatment "for months," six showed rapid improvement, one slow improvement, and one improved at first and then suffered a relapse. Four cases that gave history of previous treatment for years, and eight that gave no history of previous treatment, all improved under sulfanilamide. Where trachoma was complicated with vernal conjunctivitis (spring catarrh), the results were not so good.

The drug was given in tablets, one-half gram each, three times a day for seven days; and then an intermission of seven

days. In one case there was no intermission, and it improved rapidly. Sulfanilamide, like other new drugs of known power, must be used with caution. Great value in combating the disease for which it is used may be offset by danger of very undesirable or even fatal effects. This has been illustrated by the danger of dinitrophenol causing cataract. Intermissions in treatment have been used to guard against possible dangers of sulfanilamide. It belongs to a class of drugs that sometimes damage the blood-making organs, and cause death by leucopenia (agranulocytosis). This is sometimes, perhaps, caused by the original disease, but sometimes probably from the effect of the drug. If used long, blood counts should be made from time to time; and if the leucocytes fall below the normal number, the drug must be stopped.

It now seems we may have in sulfanilamide a drug that may cure a disease that has been known for thousands of years as a most important cause of blindness. It should be tried, with proper precautions, in every case of trachoma that is surely recognized and that may be properly watched and controlled. Can it cure? Is the cure permanent? How is the drug best used? What must be done to guard against its dangers? A large number of eye physicians and general practitioners may be properly expected to seek the answers for these questions.

Edward Jackson.

HYPERTENSIVE RETINITIS

Much of the language of ophthalmology dates back to remote antiquity. The name "cataract" was given to something which was assumed to fall across the sight. "Glaucoma" was the term applied to a condition of blindness associated with a green (or blue-gray) shimmer in the pupil. These and other expressions were

of Greek origin, because Greek physicians had laid the foundation for medical knowledge as it was still accepted and applied through the period of the Roman Empire and the centuries of the Renaissance, with its revival of classic learning and its dim groping for new scientific facts.

Our study of the ocular background in the living subject is about three fourths of a century old. Its terminology is partly antiquated and is often confusing. The term "retinitis," implying an inflammation of the retina, is attached to a number of conditions in which the retina is certainly not "inflamed," and in which the changes are of a degenerative character. To the presence of an excess of circulatory fluid in the nerve-head we often apply the peculiarly idiomatic title of "choked disc," and those who prefer a more international terminology substitute for this the term "papilledema," whose Greek origin would seem to imply a watery swelling of a protruding structure, whereas the normal optic disc represents rather a depression than a protrusion as related to the general fundus level.

The exact significance of retinal changes is often veiled in mystery. Particularly is this true as regards the relationship between retinal vascular changes and disturbances of the general vascular system. What essential distinctions are there between diabetic disturbances of the retina and those encountered in association with nephritis? How far can we interpret the grave systemic implications of general vascular hypertension, or of renal degeneration, on the basis of our ophthalmoscopic findings?

It is interesting to recall the origin of the expression "albuminuric retinitis," still more or less generally used for a group of changes of which the most striking feature is a star-shaped pattern in the macular region. Before the invention of

the ophthalmoscope, it had been common knowledge that loss of vision often occurred in association with dropsy. When the local basis for such loss of vision was found in the retina, the "retinitis" was called "albuminuric" because albuminuria was one of the prevailing symptoms of nephritis. We now know that albuminuria has no direct relationship to the retinal changes, and that indeed the latter may exist without the former.

Bright, with whose name the subject of nephritic disease has been so closely associated, assumed a cerebral location for the visual disturbances. Other writers attributed the retinal hemorrhages and other changes to increased pressure from cardiac hypertrophy. But the "retinitis" may occur in the absence of any such cardiac change.

The circulatory theory explained the retinal degeneration as depending upon the vascular changes which are so striking in the microscopic anatomy of severe cases, especially in the form of hyalin degeneration of the walls of the small arteries and the capillaries. Unfortunately for this theory, vascular changes may be entirely lacking in severe recent cases of "albuminuric retinitis."

The mechanical theory held a persistent angiospastic ischemia of the retinal vessels responsible for the conditions found with the ophthalmoscope; explaining the tissue changes as due to disturbance of nutrition by reason of deficient blood supply. Wagener and Keith have attached great importance to hypertension associated with arteriolar sclerosis.

In a monograph on this subject presented by request to the Société d'Ophthalmologie de Paris as its annual "report" (*Bulletin de la Société d'Ophthalmologie de Paris*, 1938, November; 200 pages including bibliography of 19 pages) Dubois-Poulsen takes exception to the title—"hypertensive retinitis"—under

which the subject was referred to him. He points out that in the phenomena under consideration there are neither infectious nor inflammatory lesions. The noun "retinitis" and the adjective "hypertensive" are not, he says, adapted to the sense in which they are used. He agrees with Fishberg and Gresser, who would adopt the term "hypertensive neuroretinopathy." (See Fishberg: "Nephritis and hypertension," Philadelphia, Lea and Febiger; and Gresser, *American Journal of Ophthalmology*, 1935, volume 18, page 426.)

Dubois-Poulsen suggests that greater importance should be given than previously, in the ophthalmoscopic picture of the retinopathies, to papilledema and the sphygmoscopic signs. He insists that there is nothing specific in the character of hypertensive retinopathy, but that it is merely a specialized reaction of the retinal tissue to the underlying systemic pathology. Arterial hypertension is the most frequent factor, manifesting itself in various clinical forms. Renal insufficiency is a factor almost equally important but less frequent, and the renal lesions are of a vascular type. However, arteriosclerosis, spasm, arteriolosclerosis, and local arterial hypertension may all alike exist without any retinopathic manifestation.

Who can say whether the renal lesions are secondary to the arterial hypertension, or the latter to the former? This has been one of the most debated problems in general pathology, and is not yet entirely settled. In the development of retinopathy nephritis may precede or may follow hypertension. But retinopathy may appear in the course of arterial hypertension without discoverable renal lesions, either functional or anatomic. Thus it seems logical to admit that the hypertension dominates the pathogenesis and that the renal factor is of less importance.

Direct proof for either side of the argument is lacking.

The old notion of arteriosclerosis as the underlying vascular factor has been replaced by the newer conception of arteriolar sclerosis. Thus an increased importance is attached to ophthalmoscopic examination of the smaller branches of the retinal arteries, and we are reminded once more that the background of the eye is the only place in the human body where blood vessels of arteriolar caliber may be studied in the living subject. Dubois-Poulsen lays stress upon the fact that the great majority of cases of "retinopathy" are accompanied by hypertension of the cerebrospinal fluid. This hypertension may be so severe as to create a special form simulating cerebral tumor by the presence of such functional signs as headache and vomiting, especially when complicated by papilledema.

The therapeutic possibilities in such cases are not encouraging. Dubois-Poulsen mentions, as offering the greatest prospect of symptomatic improvement, cerebrospinal decompression. Its results are often very incomplete and very inconstant. The procedure is dangerous if the decompression is excessive, and if inadequate attention is paid to the following contraindications: cardiac insufficiency, greatly elevated general arterial pressure, and very violent headaches. If the general blood pressure does not fall after puncture, decompression is useless. It is suggested that trial should be made of adrenalectomy and splanchnotomy. Some encouraging results have followed irradiation of the adrenal region.

W. H. Crisp.

BOOK NOTICE

DOCUMENTA OPHTHALMOLOGICA. Edited by A. Juhász-Schäffer. Volume 1. Paperbound, 482 pages. Masson et Cie, Paris, 1938.

The Documenta Press which has been publishing the Documenta Gynaecologica, Documenta Oto-Rhino-Laryngologica, Documenta Dermatologica, Documenta Neurologica, and so on, has now entered the ocular field with the Documenta Ophthalmologica.

The purpose of these Documenta is to present monographs on ocular subjects by outstanding workers in their particular fields. They attempt to condense the extant knowledge to date on the subject and to give their own opinions. Published as an international project with editors in many countries, the first volume contains a variety of material, extremely well handled by eminent ophthalmologists. The list is so excellent that it is worth the space to give it in full: R. Granit, Helsingfors: Processes of adaptation in the vertebrate retina in the light of recent photochemical and electrophysiological research. F. P. Fischer, Utrecht: Der Wasserhaushalt des Auges und seiner Teile. P. Bailliart, Paris: La circulation rétinienne. P. Karrer, Zürich: Die Bedeutung der Carotinoide für die Augen. A. Juhász-Schäffer, Milano: Le Vitamine nei loro rapporti con l'oftalmologia. A. Magitot, Paris: Symptomatologie du Glaucome et le problème pathogénique. J. Nordmann et Reiss, Strasbourg: Le problème physico-chimique de l'opacification du cristallin.

No attempt will be made to epitomize these articles, which are already condensations from a vast literature, one of them having 29 pages of bibliography. How successful the publication will prove in the United States is difficult to estimate because of the inability of the great majority of our ophthalmologists to read foreign languages. Only one of the seven articles is written in English. It is a pity that all of them cannot be translated into English because they are too good to be missed. The journal is worthwhile, and if

the successors to the first volume are as good as it is, there should be a definite place for this publication in the ophthalmological field.

Lawrence T. Post.

CORRESPONDENCE

TRACHOMA BODIES FROM THE NORMAL CONJUNCTIVA

1528 Crescent Street,
Montreal, Canada,
February 1, 1939

Editor, American Journal of
Ophthalmology.

Sir:

In the Ophthalmic Record of June, 1910, the undersigned in a short article reported the finding of trachoma bodies in the normal conjunctiva. At that time, in a general search for trachoma bodies in all sorts of tissue, a number of babies at the Maternity Hospital were examined, and in two of the apparently normal cases, numerous inclusion bodies were found.

Following the War period, resumption of this work was again undertaken, and

since that time have been seen a number of cases with inclusions which would have entirely escaped observation because of the mildness of the clinical signs, except that we had been constantly on the lookout for inclusion cases. This occurred not only in infants but in adults as well.

In the light of these cases, it has been my belief for some time that those previously reported as normal were mild inclusion conjunctivitides. Topley and Wilson in their latest edition state "whatever the structure of inclusion bodies may be, their presence in tissue is a sure sign of infection." With that statement I am in accord in that I now believe that the presence of inclusion bodies in the conjunctival cells, either free or within the cells, is indicative of a pathological condition.

(Signed) S. Hanford McKee, M.D.

ERRATUM

In the abstract of the Auffinger paper on page 102 of the January issue, the word "amber" was by editorial mistake substituted for "meerschau," the correct translation.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

- | | |
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| 1. General methods of diagnosis | 10. Retina and vitreous |
| 2. Therapeutics and operations | 11. Optic nerve and toxic amblyopias |
| 3. Physiologic optics, refraction, and color vision | 12. Visual tracts and centers |
| 4. Ocular movements | 13. Eyeball and orbit |
| 5. Conjunctiva | 14. Eyelids and lacrimal apparatus |
| 6. Cornea and sclera | 15. Tumors |
| 7. Uveal tract, sympathetic disease, and aqueous humor | 16. Injuries |
| 8. Glaucoma and ocular tension | 17. Systemic diseases and parasites |
| 9. Crystalline lens | 18. Hygiene, sociology, education, and history |
| | 19. Anatomy, embryology, and comparative ophthalmology |

3

PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Wheeler, J. M. Implantation of hollow grooved body into orbit for filling; late after enucleation of eyeball. *Arch. of Ophth.*, 1938, v. 20, Nov., pp. 709-712.

Correction of the appearance of sinking of an artificial eye is best accomplished by an implantation into the muscle cone behind the fundus of the socket. For this a special hollow glass body, in which four grooves have been made for reception of the recti muscles, is implanted behind Tenon's capsule. A horizontal incision is made in the conjunctiva completely across the fundus of the socket and then the conjunctiva completely dissected from Tenon's capsule, then a vertical incision is made through Tenon's capsule deep into the orbital tissues and the grooved body inserted. Mattress sutures are placed in Tenon's capsule so as to cause overlapping of the flaps and the conjunctiva is closed with interrupted sutures. A firm pressure dressing should be applied for

about one week. A prothesis may be fitted three weeks after operation. (Discussion.)
J. Hewitt Judd.

4

OCULAR MOVEMENTS

Bielschowsky, A. Lectures on motor anomalies. 4. The etiology of strabismus. *Amer. Jour. Ophth.*, 1938, v. 21, Dec., pp. 1329-1342.

Bielschowsky, A. Lectures on motor anomalies. 5. Development and course of strabismus. *Amer. Jour. Ophth.*, 1939, v. 22, Jan., pp. 38-43.

Grove, R. C. Unusual combination of ocular paralyses following radical operation on antrum. *Arch. of Otolaryng.*, 1938, v. 27, March, p. 275.

Grove presents a case in a white male aged 52 years, in whom a radical Caldwell-Luc operation was done on an antrum. Immediately following this, and still present after 2½ years, was a paralysis of the abducens and of the long branch of the inferior division of the oculomotor. This was due to trauma

by instrumentation through a defect in the floor of the orbit.

Theodore M. Shapira.

Miklos, Andor. Does an escape squint occur after squint operations? *Graefe's Arch.*, 1938, v. 139, pt. 3, pp. 532-540.

In the author's experience, based upon 300 cases, an escape squint as claimed by Van der Hoeve never occurs after operation for strabismus.

H. D. Lamb.

Vorisek, E. A. The treatment of concomitant convergent strabismus. *Amer. Jour. Ophth.*, 1938, v. 21, Dec., pp. 1356-1360.

5

CONJUNCTIVA

Agnello, Francesco. Papilloma of the caruncle. *Rassegna Ital. d'Ottal.*, 1938, v. 7, July-Aug., pp. 553-559.

The writer gives a good description of the anatomy of the lacrimal caruncle and discusses the various tumors which arise from this structure. He cites the case of a 62-year-old man with a papilloma of the left caruncle. From the histologic findings he classifies the growth as a papilloma with cutaneous epithelium. Up to 1928 only 189 tumors of the caruncle had been reported. (2 figures.)

Eugene M. Blake.

Mathis, Giovanni. Ocular lesions in myxomatosis of rabbits. *Rassegna Ital. d'Ottal.*, 1938, v. 7, July-Aug., pp. 543-552.

Myxoma is a particular affection of rabbits and presents a characteristic and nearly constant pathologic picture, ending in death within a few days. The author studied a series of cases in rabbits and concludes from clinical and

histologic examinations that the myxomatous virus induces severe acute catarrhal conjunctivitis with striking macroscopic and microscopic alterations of the connective tissue of the lids. The changes are similar to those occurring in the subcutaneous tissues of other parts of the body, especially about the natural orifices. (4 figures.)

Eugene M. Blake.

Muscatello, Francesco. A peculiar histologic aspect of bilateral conjunctival hyperplasty in trachoma. *Boll. d'Ocul.*, 1938, v. 17, March, pp. 195-210.

The writer describes the histomorphology and histochemistry of a hyperplastic granulomatous conjunctiva which had been affected by trachoma. The patient was a woman 41 years of age. (Bibliography, 9 figures.)

Melchior Lombardo.

Poleff, L., and Nain, M. The Weill-Félix reaction in trachoma and its theoretical and clinical value. *Revue Internat. du Trachome*, 1938, v. 15, July, p. 113. (See *Amer. Jour. Ophth.*, 1939, v. 22, Feb., p. 217.)

Sobhy Bey. A propos "The pyrexias and trachoma." *Rev. Internat. du Trachome*, 1938, v. 15, July, p. 126.

Monocular trachoma was cured by an attack of measles. This case is cited to show the basis for the author's success with milk injections in trachoma.

J. Wesley McKinney.

Thygeson, P., and Richards, P. Nature of the filtrable agent of trachoma. *Arch. of Ophth.*, 1938, v. 20, Oct. pp. 569-584; also *Trans. Sec. on Ophth.*, *Amer. Med. Assoc.*, 1938, 89th mtg.)

The virus of trachoma, with the

viruses of inclusion blennorrhea and psittacosis, appear to form a group transitional between the rickettsiae and the typical viruses. The results in 22 filtration experiments are summarized to show that the etiologic agent is filtrable under certain conditions. The facts presented by a summary of 320 cases in ten series indicate that this agent has the characteristics of a virus (filtrability, inclusion-body formation, and noncultivability on nonliving mediums), and that it is identical with the elementary body of Halberstädter and Prowazek. J. Hewitt Judd.

Torres Estrada, A. Some rules of conduct for treatment of pterygium. *Anales de la Soc. Mexicana de Oft.*, 1937, v. 11, Jan.-March, pp. 187-204.

Several operative procedures are well illustrated. The author considers it very important in each case to know whether the pterygium has invaded Bowman's membrane. He outlines and illustrates the technique used by himself, the steps of which are briefly as follows: transfixion with a cataract knife, the back of which is then used to separate the head of the pterygium thoroughly from the cornea; resection of the head of the pterygium; removal of the episcleral tissue underlying the body of the pterygium; an incision upward from the upper edge of the pterygium near the semilunar fold, and a second incision downward from the lower edge of the pterygium near the limbus, the flap formed by the upper incision being carried into the gap left by the lower incision so as to form a sutured "N" perpendicular to the palpebral aperture. (The description of this procedure is not entirely clear.) The author regards this technique as less likely than the McReynolds to be followed by recurrence. W. H. Crisp.

6

CORNEA AND SCLERA

Bessey, O. A., and Wolbach, S. B. Vascularization of the cornea of the rat in riboflavin deficiency with a note on corneal vascularization in vitamin-A deficiency. *Jour. Exper. Med.*, 1939, v. 69, Jan. 1, p. 1.

The authors kept albino rats on riboflavin-deficient diets and studied vascularization of the cornea by microscopic, injection, and slitlamp methods. The rats ceased to grow after three weeks, and by the end of the fourth week a marked radial ingrowth of capillaries into the cornea from the limbus vessels could be seen by slitlamp. Later corneal turbidity due to leucocytic infiltration developed. After supplying the deficient riboflavin to the diet, the corneal turbidity usually cleared within 48 hours, and after two weeks the blood vessels could no longer be seen by slitlamp. In reviewing studies on the vascularization of the cornea in vitamin-A deficiency, great similarity between this and the vascularization in riboflavin deficiency was found. The rôle of riboflavin as a respiratory carrier and the altered physiology following keratinizing metaplasia in vitamin-A deficiency suggested that the vascularization in each case might be in response to asphyxia of the corneal stroma. (Illustrations.) George A. Filmer.

Gundersen, Trygve. Results of autotransplantation of cornea into anterior chamber; their significance regarding corneal nutrition. *Arch. of Ophth.*, 1938, v. 20, Oct., pp. 645-650.

The finding of the scleral disc in the anterior chamber of a patient on whom a trephining operation had been performed eight years previously suggested these experiments in which the

viability of all corneal layers in the aqueous humor was studied by introducing full thicknesses of cornea into the anterior chamber in seventeen cats and ten rabbits. A disc of cornea was removed from one eye with a mechanical trephine and immediately introduced into the anterior chamber of the opposite eye through a small keratome incision. It was found that the corneal epithelium could not subsist when nourished by the aqueous alone, as it disappeared entirely from each implant. The other corneal tissues can live almost unaltered in aqueous for a period up to the duration of these experiments, twenty months. The endothelium not only lives but proliferates. (Photomicrographs.) J. Hewitt Judd.

Kentgens, S. G. Vitamin-A therapy in corneal lesions. *Ophthalmologica* (formerly *Zeit. f. Augenh.*), 1938, v. 96, Oct., p. 1.

The author believes that systemic and local use of vitamin A is useful in herpes, keratitis punctata, marginal ulcers, and catarrhal ulcers. In 48 patients afflicted with one of these lesions and treated with vitamin A, the average healing time was seven days, while 38 patients with similar lesions from whom vitamin-A preparations were withheld had an average healing time of eighteen days. In systemic therapy he uses standardized cod-liver oil; locally, this same preparation as eye drops or made into an ointment.

F. Herbert Haessler.

Kraupa, Ernst. Punctate and annular corneal degeneration. *Ophthalmologica* (formerly *Zeit. f. Augenh.*), 1938, v. 96, Oct., p. 34.

In each of two patients, aged 50 and 69 years respectively, a white corneal opacity was observed less than 0.25

mm. in diameter. Slitlamp observation showed the defect to consist of finest bluish-white punctate opacities in several of the more superficial strata of the substantia propria. The entire opacity was surrounded by a ring just under Bowman's membrane, beyond which were a few scattered puncta. There was no corneal vascularization. The manifestations did not change with treatment and diet as do the corneal opacities associated with synchysis scintillans. The annular part of the opacity is unique. It is entirely different from the inflammatory halo surrounding foreign bodies, ulcers, herpes, hemosiderin, the annular rents of Bowman's membrane in keratoconus after blunt trauma, the Kayser-Fleischer ring, or outer or inner embryotoxon or gerontoxon. The ring in question is not sharply delimited and is not closed. The significance of the case is not clear.

F. Herbert Haessler.

Roy, J. N. Tattooing of the cornea. *Ann. d'Ocul.*, 1938, v. 175, Nov., pp. 836-841.

Report of a case of successful India-ink tattooing of a corneal leucoma in several stages. John M. McLean.

Salzmann, Maximilian. Glaucomatous degeneration of the cornea. *Graefe's Arch.*, 1938, v. 139, pt. 3, pp. 413-464. (See Section 8, Glaucoma and ocular tension.)

Seech, S. G., and Cooper, W. L. Experimental iontophoresis of rabbits' corneas. Report of two cases of corneal dystrophy with treatment by ionic medication. *Arch. of Ophth.*, 1938, v. 20, Oct., pp. 624-640.

The literature is reviewed and the results of animal experimentations for the purpose of investigating the efficacy

of zinc sulphate, zinc chloride, barium chloride, sodium chloride, colloidal sulphur, and quinine bisulphate are reported. A definite sequence of tissue changes in the rabbit corneas was found. These changes are divided into reparative or therapeutic, borderline changes, and pathologic or destructive changes. The authors believe that the reparative or therapeutic changes produced by this method of treatment are definitely beneficial, and they report two cases with corneal dystrophy in which the treatment was successful. The tissue changes are shown by photomicrographs. J. Hewitt Judd.

Swindle, P. F. Events of vascularization and devascularization seen in corneas. *Arch. of Ophth.*, 1938, v 20, Dec., pp. 974-995.

The metamorphosis of the arterio-venous anastomoses in the cornea of the Rocky-Mountain bighorn lamb, which is the only animal in which the apparently normal cornea becomes extensively invaded by blood vessels, is not completed until the lumen of the principal arterial trunk becomes spontaneously obliterated. The bouquets of vascular loops vanish rapidly after the lumens of the principal arterial trunks become obliterated. By means of rhythmic injection of India ink or red mercuric sulphide the vascularization of the corneae of various normal and ailing animals has been studied and the results are reported here. An inflamed cornea may become almost completely vascularized by preëxisting scleral and conjunctival vessels before a new blood vessel develops in it. In fact, many vessels may become destroyed in the process. This is vascularization unaccompanied by neovasculogenesis. The development of loops and incomplete loops or diverticula and the spontane-

ous destruction of corneal vessels are described. (Photomicrographs.)

J. Hewitt Judd.

Trematore, M. Parenchymatous keratitis in acquired syphilis. *Rassegna Ital. d'Ottal.*, 1938, v. 7, July-Aug., pp. 520-534.

Trematore reports a case of interstitial keratitis occurring less than two months after an initial genital sore in a sixteen-year-old boy in whom no signs of hereditary lues could be found. There was no evidence of the disease in the parents or any of the other six children. Wassermann reactions were negative and remained so even after provocative injections. After five months of treatment, the cornea of one eye cleared, leaving no trace of cicatrization or vascularization. The author reviews the literature pertaining to the subject. He cites the rather widely divergent findings as to frequency of interstitial keratitis in acquired syphilis, and discusses the questions of reinfection and superinfection in syphilis.

Eugene M. Blake.

Verhoeff, F. H., and King, M. J. Scleromalacia perforans. *Arch. of Ophth.*, 1938, v. 20, Dec., pp. 1013-1035. Also *Trans. Sec. on Ophth.*, Amer. Med. Assoc., 1938, 89th mtg.

Fourteen cases of scleromalacia perforans described in the literature are reviewed and a new typical case is reported. It is the first in which an eye affected with this disease has been obtained for microscopic examination. The patient was afflicted with rheumatoid arthritis. The primary ocular lesion consists of a sharply defined area of necrotic scleral tissue, which becomes surrounded by a wall of endothelioid cells and is slowly infiltrated with pus cells. This produces a seques-

trum which becomes completely disintegrated and densely infiltrated with necrotic pus cells. The abscesses perforate the sclera and discharge their contents externally, producing the characteristic cavities. Histologically, in their initial stages the scleral nodules are essentially similar to the subcutaneous nodules of rheumatoid arthritis. To avoid intraocular complications from the toxins, curettage of the scleral nodules is suggested. (Photograph, color plate, photomicrographs, discussion.) J. Hewitt Judd.

7

UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Ascher, K. Epithelial downgrowth into anterior chamber; regressive changes and healing after roentgen therapy. *Ophthalmologica* (formerly *Zeit. f. Augenh.*), 1938, v. 96, Oct., p. 29.

Downgrowth of epithelium into the anterior chamber probably occurs from delayed closure of the wound. It is unlikely that implantation of epithelium into the anterior chamber during operation is a factor. Thermocautery, radium, and roentgen rays have been used therapeutically, not always with success.

In one patient, the author applied roentgen therapy—a total of 1800 r. in five doses at intervals of four to seven days. After the second treatment, the membrane became thinner and gradually disintegrated. The eyeball became and remained normal, with a vision of 6/6. F. Herbert Haessler.

Bencini, Alberto. Congenital familial diffuse atrophy of the choroid. *Boll. d'Ocul.*, 1938, v. 17, April, pp. 217-254.

Two brothers aged 35 and 38 years respectively complained of progressive diminution of visual power and of hemeralopia. Both were myopic. The

fundus examination showed pinkish discs with blurred margins and contracted arteries, a circumpapillary zone of choroidal atrophy diffusely pigmented, and around this a sector of atrophic choroid. At the periphery the fundus had a blackish-red aspect. The pigment, diffusely distributed throughout the fundus, was irregularly massed in some places and absent in others, but nowhere had an osteoblastic form. The visual fields were markedly contracted, and the light sense markedly lowered. The family history is given, and shows only the males affected. In spite of possessing some characteristics in common with pigmentary degeneration of the retina, the present case differed from that entity in the absence of a diencephalic symptomatology, in the possession of normal renal function, and in other ways. (Bibliography, 9 figures, 2 tables, 4 colored pictures.)

Melchior Lombardo.

Berens, C., Angevine, D. M., Guy, L., and Rothbard, S. Eye lesions in experimental infections, special reference to arthritis. *Amer. Jour. Ophth.*, 1938, v. 21, Dec., pp. 1315-1327.

Friedenwald, J. S., and Stiehler, R. D. Circulation of the aqueous. 7. A mechanism of secretion of the intraocular fluid. *Arch. of Ophth.*, 1938, v. 20, Nov., pp. 761-786.

To facilitate continuity of the argument and to avoid confusion, this report on the character and mechanism of the irreciprocal permeability of the ciliary body presents the details of the experimental technique and protocols in small type and the text in large type, but the two portions are so arranged that they may be read continuously. The experiments include investigations of the permeability of the ciliary body to various

acid and basic dyes, the oxidation-reduction potentials of the ciliary body, the enzyme systems of the stroma and epithelium, the stroma-epithelium barrier, the transfer of water and the other components of the blood-aqueous barrier, the capillary wall, and the epithelial-cell membrane. It was discovered that the ciliary body showed an irreciprocal permeability to certain dye stuffs as well as to water, and the behavior of the dyes indicated that an electrical phenomenon was involved. Water and basic dyes are transferred from the stroma to the epithelium, that is, from the blood to the aqueous, and the acid dyes in the reverse direction. An electrical current which transfers the water and cations from the stroma to the epithelium and the anions from the epithelium to the stroma is supplied by the differences between the oxidative and the reductive processes in epithelium and stroma. The electric circuit is completed by an electron transfer through the stroma-epithelium barrier, presumably through the reversible oxidation-reduction system of the barrier. An appendix to the paper contains information regarding identification of the dyes, association or polymerization, and the ionic charge and relative mobility of the dyes.

J. Hewitt Judd.

Robertson, J. D. Some observations on fluid interchange and its bearing on certain ophthalmological problems. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 75.

Combined study of fluid interchange and intraocular pressure confirms the opinion held by the author for the last few years that the aqueous humor cannot be regarded as a dialysate. The response of intraocular pressure to intra-

venous injection of solutions of various concentrations cannot be explained by the simple laws which govern a dialysate. This, combined with other evidence, points to formation of the aqueous humor by the mechanism of secretion.

Beulah Cushman.

Samuels, Bernard. Panophthalmitis and sympathetic ophthalmia. *Arch. of Ophth.*, 1938, v. 20, Nov., pp. 804-811; also *Trans. Amer. Ophth. Soc.*, 1938, v. 36.

This discussion includes an explanation of varying amounts of uvea remaining in phthisic globes following closed and open panophthalmitis, the incidence of panophthalmitis in sympathetic ophthalmia, the diagnosis of sympathetic tissue in panophthalmitis, the clinical importance of diagnosis of sympathetic ophthalmitis from the microscopic picture, the ordinary lymphocytic infiltration and sympathetic lymphocytic infiltration in the choroid, and the bearing that the facts presented may have on experimental work in sympathetic ophthalmia.

J. Hewitt Judd.

Valle, Sergio. Concerning Hoffmann's "early leprous choroiditis." *Arquivos Brasileiros de Oft.*, 1938, v. 1, Aug., pp. 31-51.

The author confirms the opinions expressed by Adjemian about forty years ago, namely that the diagnosis of this condition has not been firmly established, and that for its proof all other causes must be excluded.

W. H. Crisp.

Waldmann, Béla. Parallel study of the pathogenesis of rhinogenous optic neuritis and of serous iritis. *Amer. Jour. Ophth.*, 1939, v. 22, Jan., pp. 44-53.

8

GLAUCOMA AND OCULAR TENSION

Bellows, J., Punttenney, I., and Cowen, J. Use of sorbitol in glaucoma. *Arch. of Ophth.*, 1938, v. 20, Dec., pp. 1036-1043.

Laboratory experiments on dogs showed that sorbitol was slightly diffusible into the anterior chamber, and the drug was found to be an effective agent in reducing abnormally high intraocular tension when injected intravenously into human beings. The results in twelve cases are tabulated. Because of its slight diffusibility, a secondary rise in tension above the initial value was not observed. It is suggested that 100 c.c. of a 50-percent solution of sorbitol be administered intravenously and repeated in 24 hours if necessary. It is especially useful in those cases not responding to miotics and as a preparation for operation. J. Hewitt Judd.

Bhaduri, B. N., and Biswas, C. K. Effect of dark adaptation on the tension of eyes in patients suffering from epidemic dropsy. *Calcutta Med. Jour.*, 1938, v. 34, Sept., p. 206. (See *Amer. Jour. Ophth.*, 1938, v. 21, May, p. 571.)

Bhaduri, B. N. Enormous reduction of intraocular tension in the unoperated eye following sclerocorneal trephining in the other eye in a case of epidemic dropsy. *Calcutta Med. Jour.*, 1938, v. 34, Dec., p. 532.

A case report of a sixteen-year-old girl with high intraocular tension and vision reduced to light perception in both eyes. Following Elliot trephining of one eye, the tension in the unoperated eye dropped to 37 mm. Hg (Schiötz) and vision shortly returned to normal. Tension in the unoperated eye remained somewhat elevated and

the visual field became further contracted, so trephining was later necessary on this eye also.

George A. Filmer.

Ernsting, H. C. Intraocular tension in electropyrrexia. *Amer. Jour. Ophth.*, 1939, v. 22, Jan., pp. 54-56.

Holmes, W. J. Congenital buphthalmos complicated by dislocation of lens and hemorrhage into vitreous, with complete recovery of central vision. *Arch. of Ophth.*, 1938, v. 20, Nov., pp. 757-760.

A man aged 31 years was struck by a finger in his only eye, which was buphthalmic, and on which a Lagrange operation had been performed fifteen years previously. A massive hemorrhage into the anterior chamber and vitreous obscured for a time the fact that the lens was dislocated backward. Later the lens appeared as a freely swinging white mass back of the ciliary region. The author feels that the remarkable final vision, the maintenance of normal intraocular tension, and the absence of any further constriction of the field over a period of a year after the injury are due largely to the fact that the drainage operation had been done early and properly.

J. Hewitt Judd.

Salzmann, Maximilian. Glaucomatous degeneration of the cornea. *Graefe's Arch.*, 1938, v. 139, pt. 3, pp. 413-464.

Degenerative changes in the cornea occurring in glaucoma may be divided into those of the epithelium, those of the superficial nerves, and pannus extending from the limbus. These are described and illustrated under epithelial opacities, shrinking, swelling, necrosis of the epithelial cells, the for-

mation of superficial vacuoles and hollow spaces in the epithelium, hydropic degeneration of the cells, and the formation of fluid between the epithelial cells. Changes of the superficial nerves include dilatation of the nerve canals in Bowman's membrane, proliferation of the cells of the nerve-fiber sheath, groups of cell nuclei in phlyctenule-like formations in the break in Bowman's membrane, and formation, over the breaks, of islands of avascular connective tissue. The author thinks the entire process could be designated superficial neurodystrophy of the cornea. Glaucomatous pannus always contains blood vessels and proceeds from the limbus between the epithelium and Bowman's membrane. Pannus is less frequent than neurodystrophy, and remains confined to the marginal zone of the cornea.

Under intense varieties of corneal degeneration, there is described an increase in the number of layers of the epithelium with or without elevation in the form of a bulla and a membranous formation within the epithelium.

H. D. Lamb.

Schmelzer, Hans. Observations in the constitutional causes of glaucoma. *Graefe's Arch.*, 1938, v. 139, pt. 3, pp. 465-479.

Comparison of the blood chemistry in 55 cases of primary glaucoma as compared with that in 45 individuals of the same ages without glaucoma revealed that the cholesterine content was very much increased and the xanthoprotein reaction was positive in almost all the persons with glaucoma. It could be concluded therefore that a certain disturbance of the action of the liver was present in the cases of glaucoma. In addition to local therapy in the

treatment of glaucoma, the author advises accordingly a diet low in fats and high in carbohydrates (much vegetable, salad, fruit, coarse bread, and fruit juices).

H. D. Lamb.

Zamenhof, Adam. Incision perpendicular to the surface of the globe in glaucoma operations. *Ann. d'Ocul.*, 1938, v. 175, Nov., pp. 846-853.

An ordinary Gillette razor blade in a special holder is used to make the ab externo incision for simple iridectomy or sclerecto-iridectomy for glaucoma.

John M. McLean.

9

CRYSTALLINE LENS

Case, P. H. An interne's experiences with the Verhoeff method of cataract extraction. *Arch. of Ophth.*, 1938, v. 20, Oct., pp. 651-656.

The technique of the Verhoeff method is described and the advantages of the corneoscleroconjunctival suture presented. In the author's first series of 57 attempted intracapsular extractions, 51 lenses were removed in capsule. Loss of vitreous occurred in three of the cases in which the capsule was removed intact and in two of the six cases in which the capsule ruptured. The apparent causes of the rupture of the capsule were: poor coöperation of the patient, posterior synechiae which were not freed first, patient's youth, intumescent cataract, and high myopia. A brief report is given of the cases in which the capsule ruptured. J. Hewitt Judd.

Chandler, P. A. Inferior iridotomy in operations for cataract on eyes with posterior synechiae or pupillary membrane. *Arch. of Ophth.*, 1938, v. 20, Oct., pp. 641-644; also *Trans. Amer. Ophth. Soc.*, 1938, v. 36.

In order to insure a permanent pupillary opening in those eyes previously affected with iritis or cyclitis, or operated upon for glaucoma, an inferior iridotomy is recommended before the lens is removed. After the usual incision, any posterior synechiae are freed with a spatula, and the iris is split from the lower pupillary margin nearly down to the root with a Noyes scissors. This procedure has given adequate and permanent results in all but one of approximately twenty eyes. Even if the pupil closes no harm has been done. Two illustrative cases are reported in detail.

J. Hewitt Judd.

Ciotola, Guido. Two cases of double-rosette cataract. *Rassegna Ital. d'Ottal.*, 1938, v. 7, July-Aug., pp. 504-520. (See Section 16, Injuries.)

Cullom, M. M. A new capsule grasping forceps. *Arch. of Ophth.*, 1938, v. 20, Oct., p. 1045.

This is a double-headed forceps designed to grasp the capsule at two points. There is a spread of 4 mm. between each pair of blades. The forceps are shown open and closed in photographs. (Note by editor: The second illustration seems to give a false idea of the relative position of the two pairs of blades.)

J. Hewitt Judd.

Krause, A. C. Chemical pathogenesis of cataract. *Amer. Jour. Ophth.*, 1938, v. 21, Dec., pp. 1343-1355.

Legrand, J. Surgical treatment of dislocated lens in the vitreous. *Arch. d'Ophth. etc.*, 1938, v. 2, Oct., p. 924.

Surgery of the luxated or subluxated lens has always been considered a serious and hazardous operation. The literature is most pessimistic, though many methods have been described, from the

vectis or curette operation of Snellen and Pagenstecher to the transforming of a posterior luxation into an anterior one by pressure from behind, or using mydriasis and then placing the patient in a ventral position. There are practical objections to each of these methods, chief of which is the chance of glaucoma. That is why the author utilizes a small knife with interchangeable blades, constructed by Moria, for transfixion of the lens in the anterior chamber. As soon as this is accomplished the patient is turned on his back, and removal of the lens proceeds in the usual way. Two cases of luxated lens in which the instrument was successfully used are described.

Derrick Vail.

Olmos, E. S. Combined cataract operation. *Anales Soc. Mexicana de Oft.* etc., 1938, v. 12, Jan.-July, pp. 141-150.

The author's technique includes substitution of the Desmarres elevator for the lid speculum, a Kalt suture toward the nasal side, and a conjunctival flap toward the temporal side. (Discussion.)

W. H. Crisp.

Parker, F. C. A cataract operation to reduce the incidence of prolapse of the iris. *Arch. of Ophth.*, 1938, v. 20, Oct., pp. 597-603.

The author objects to the usual manner of making the incision on the ground that it stretches the lower portion of the cornea and causes a greater tendency to prolapse of the iris. He suggests fixation above and an incision in which the heel of the knife is raised first, so that the tissues tend to be pushed inward. The next step is to raise the point end of the knife as it is being withdrawn. These motions are repeated until the incision is complete. The

points presented are shown by drawings.
J. Hewitt Judd.

Samuels, Bernard. Pathology of complicated cataract. *Southern Med. Jour.*, 1939, v. 32, Jan., p. 70.

The author discusses lens opacities occurring as a result of other lesions within the eyeball, such as inflammation, glaucoma, tumors, necrosis of surrounding tissues, and mechanical causes. He advises that a good general rule in the treatment of such cataracts is to wait at least one year after the eye becomes free of every sign of inflammation before operating, and then to use the extracapsular method following a preliminary iridectomy.

George A. Filmer.

Tupinamba, J., and Souza Dias, João de. Marfan's syndrome with ectopia lentis. *Rev. de Oft. de São Paulo*, 1938, 6th yr., April-June, pp. 61-66.

Beside subluxation of both lenses upward and to the right, the patient, a girl of eleven years, presented long slender build, muscular atrophy, dry and furrowed skin, and the long bones unduly long and slender. This combination the authors interpret as an abortive form of Marfan's syndrome. But the blood Wassermann was negative.

W. H. Crisp.

Wiederkehr, Willy. Further contribution to senile exfoliation of the anterior capsule, based on slitlamp and histologic findings in 18 eyes from 14 patients between 60 and 104 years of age. *Graefe's Arch.*, 1938, v. 139, pt. 3, pp. 541-552.

The author confirms the three principal types of senile exfoliation of the anterior capsule as described by Vogt: lamina-like loosening of the superficial

lamella, exfoliation with focal thinning of the capsule, and light flaky-like dissociation of the lamellae of the capsule. This senile exfoliation affects only the anterior capsule and predominantly the thick part near the anterior pole of the lens.
H. D. Lamb.

Winkler, Adolf. Contribution to the genesis of dermatogenic cataract. *Graefe's Arch.*, 1938, v. 139, pt. 3, pp. 526-531.

In a 27-year-old man with eczema, a predominantly anterior subcapsular cataract was present in each eye. The only anomalies of metabolism found were a metabolic indicanuria and elimination of loosely bound phenol.

H. D. Lamb.

10

RETINA AND VITREOUS

Bonnet, P. Ophthalmoscopic after-effects, two years later, of a thrombosis of the inferior temporal vein. *Bull. Soc. d'Ophth. de Paris*, 1937, May, p. 344.

A light perivascular halo at the site of the previous thrombosis was all that could be found. The fields had become normal and vision had increased from 0.3 to 0.6 during the interval.

Harmon Brunner.

Burian, H. M. The influence of the central nervous system on the pigment migration in the retina of the frog. *Amer. Jour. Ophth.*, 1939, v. 22, Jan., pp. 16-24.

Esser, A. A. M. Schüller-Christian disease. *Schweiz. med. Woch.*, 1938, Aug. 27, p. 1014.

Esser reports a case that he has observed for three years in the pediatric clinic of the university in Basel. Because of changes found in the reticulo-

endothelial system, he believes that the condition is infectious.

Theodore M. Shapira.

Kalt, E., and Bailliart, P. **A case of juvenile degeneration of the macula.** Bull. Soc. d'Ophth. de Paris, 1937, May, p. 309.

Careful description of the progress of a case in a male aged 34 years. The author discusses the etiology and regards the malady as a vascular insufficiency usually organic, but which may be functional. Harmon Brunner.

Keyes, J. E. L., and Goldblatt, H. **Experimental hypertension. 8. Vascular changes in the eyes.** Arch. of Ophth., 1938, v. 20, Nov., pp. 812-828. Trans. Sec. on Ophth., Amer. Med. Assoc., 1938, 89th mtg.

The eyes of dogs and monkeys with persistent hypertension following constriction of the main renal arteries have been observed for more than five years. The changes described, and illustrated by photomicrographs, are similar to those seen in man with benign and malignant essential hypertension. (Color plate of fundus changes, discussion.) J. Hewitt Judd.

McDonald, R., and Lippincott, S. W. **Angiomatosis retinae.** Arch. of Ophth., 1938, v. 20, Dec., pp. 958-965.

This condition was found in a boy aged fifteen years, in whom the disease had been present since the age of five years. The diagnosis was made in the left eye by ophthalmoscopic examination, and was confirmed by histologic examination of the blind right eye. The authors feel that the initial event is the formation of angioblastic derivatives, represented by cystic dilatations and capillaries, and that the gliosis is secondary. Secondary changes include

exudation, hemorrhages, detachment of the retina, iridocyclitis, secondary glaucoma, cataract, and finally hypotension with phthisic changes. The tumor is shown to be of vascular origin, representing a congenital malformation, even though the gliosis is so marked that it nearly masks the true derivation of the tumor. (Photomicrographs.)

J. Hewitt Judd.

Magitot, A. **Recent and partial idiopathic detachment of the retina.** Ann. d'Ocul., 1938, v. 175, Nov., pp. 797-807.

A 35-year-old non-myopic patient had a detachment of the temporal side of the retina without associated trauma. Twenty days after it was discovered the eye was enucleated, and it was studied in serial sections. No tumor was found. There was a small disinsertion at the ora. There were no traction bands or abnormal proliferations in the vitreous.

On the attached as well as the detached side the pigment-epithelial cells showed hyaline production, pigment rarification, and alteration in form. Under the retina which had not become separated, an albuminous fluid was beginning to infiltrate between the choroid and the epithelial layer. All the pigment epithelium in this eye, including that of the iris, seemed to be undergoing pathologic changes. In the adherent side the retina itself appeared quite normal and showed none of the degenerative changes of the detached areas. The choroid was not hyperemic, sclerotic, or inflamed. The choriocapillaris, alone, showed small atrophic areas.

The author suggests that primary lesions of the pigment epithelium cause formation both of hyaline excrescences and albuminous subretinal fluid, and that a poorly understood disease of the

pigment epithelium may be the underlying factor in "idiopathic" detachment.

John M. McLean.

Matsuda, S. The injurious action of hepatic and splenic toxins on the eye. *Graefe's Arch.*, 1938, v. 139, pt. 3, pp. 503-512.

Experiments with rabbits showed that toxins from the spleen exerted an injurious action upon the eye similar to that of hepatic toxins. This fact disproves a specific relation between the retina and the kidneys, and involves the conclusion that nephrotoxic material in man plays an essential factor in the production of albuminuric retinitis.

H. D. Lamb.

Measurement of the average width of retinal vessels and its meaning in differential diagnosis of hypertension and nephritis. *Schweiz. med. Woch.*, 1938, Oct. 29, p. 1215.

The non-indicated author of this review states that according to the latest advances in the study of hypertension and nephritis, observations on the width of the arterioles are most essential. A new and accurate method to measure this has been found by Lobeck of Jena. Further, he states, the method is very quick and simple. Lobeck has had Zeiss make a measuring ocular which is attached to the Gullstrand ophthalmoscope. Instead of measuring the width of the retinal arterioles on the patient's retina, they are measured on the lens attached to the Gullstrand.

Theodore M. Shapira.

Nicholls, J. V. V. The effect of section of the posterior ciliary arteries in the rabbit. *Brit. Jour. Ophth.*, 1938, v. 22, Nov., pp. 672-687.

This article represents a re-evaluation of the findings of Wagenmann

some 45 years ago, Krückmann in 1899, and Capauner in 1893. Gonin, Nettleship, Greeves, and others, since 1902, have suggested that a choroidal vascular disturbance is the underlying cause of pigmentary degeneration of the retina. Wagenmann produced such degeneration by section of the posterior ciliary arteries. In the experiments now reported the Wagenmann technique was followed as closely as possible. Young adult rabbits were used, the twenty eyes operated on being for the most part pigmented. The method employed is fully described. Wagenmann's results in producing pigmentary degeneration of the retina by section of the posterior ciliary arteries are confirmed. Nevertheless, the results of the present experiments do not confirm the vascular theory of causation of retinitis pigmentosa, but, on the contrary, evidence was found against such a theory. (Illustrations, tables, references.)

D. F. Harbridge.

Orzalesi, F., and Cassuto, N. Sympathol action on the pressure of the central artery of the retina. *Boll. d'Ocul.*, 1938, v. 17, April, pp. 270-278.

The chemistry of this synthetic product resembles that of adrenalin. Its pharmacodynamic action was tested in twelve patients by conjunctival instillation or by the hypodermic route, with the idea of learning its behavior on retinal arteries. The age of the patients, seven of them males, varied from 20 to 38 years. Sympathol provoked a lowering of retinal blood pressure which manifested itself ten minutes after the injection and reached its maximum after thirty minutes. After two hours the pressure had returned to the original level. In two of the cases no appreciable variations were noted. For instillation a ten-percent solution was

used, and the results were the same. In no case was an increase of pressure noted. In a case of intracranial hypertension the retinal pressure showed no variation. (Bibliography, 2 figures.)

Melchiorre Lombardo.

Prado, D. L. do. Thrombosis of the central retinal vein secondary to dental infection. *Rev. de Oft. de São Paulo*, 1938, 6th yr., April-June, pp. 76-78. (See *Amer. Jour. Ophth.*, 1938, v. 21, Nov., p. 1298.)

Rintelen, F. Remarks on measurements of blood pressure in the retinal vessels. *Ophthalmologica* (formerly *Zeit. f. Augenh.*), 1938, v. 96, Oct., p. 14.

Adequate local anesthesia is absolutely essential. Often pressure readings that are too high result from tangential application of the dynamometer because the partially anesthetized eye moves away from the instrument. Careful and deliberate application of the instrument is essential, and it is unnecessary to hurry to avoid changing the intraocular pressure by prolonged application of the dynamometer. Comparative measurements have demonstrated to the author that one may take five to ten seconds for the measurement without significantly modifying the readings. Too rapid a tempo does not allow accurate determination of Fritz's index; that is, the difference between the pressure that causes the first oscillation of the arterial wall and that producing complete collapse. It is of value in judging rigidity of the vessel wall.

Frequently a difference between the diastolic pressure in the right and left eyes is found and is of significance, but conclusions must never be drawn from this finding except when a tonometric reading has been combined with the dynamometric.

metric reading has been combined with the dynamometric.

Measurements in tabetics did not disprove Sobonski's assertion that hypotony is the cause of tabetic optic atrophy. However, the author points out that hypotony cannot be the decisive factor or atrophy would be observed frequently in aortic insufficiency.

F. Herbert Haessler.

Schuck, C., and Miller, W. O. Dark adaptation of the eye and vitamin-A storage in young adults. *Arch. of Internal Med.*, 1938, v. 61, June, p. 910.

On examination of 94 female freshman students between the ages of 17 and 22 years, poor dark adaptation was shown in 26.6 percent. Eighteen experimental subjects showed improvement under treatment with vitamin A. Some of the subjects failed to improve under vitamin F. Further studies on the action and uses of vitamin A are advised.

Theodore M. Shapira.

Seidel, E. A very rare retinal disease as partial manifestation of a general hereditary disorder. *Graefe's Arch.*, 1938, v. 139, pt. 3, pp. 520-525.

Tuberous sclerosis was diagnosed in the case of a fourteen-year-old girl with sluggish mentality and bilateral choked disc. In addition, in the fundus of the right eye, temporal to the optic papilla and about in the horizontal meridian, there were observed two cystic-appearing tumors, each in width about a disc diameter. In the fundus of the left eye, a similar swelling was present just above and temporal to the optic nerve. A reddish-brown slightly elevated spot the size of a pea was present in the forehead near the root of the nose. Similar spots were noted in the middle of the upper part of the left cheek, between the shoulder blades, under the

left scapula, under the left costal arch, and on the flexor surface of the thigh. In the skin of the cheeks were a great number of small, reddish, firm, warty growths of the size of the head of a pin, such as are known as sebaceous adenomata.

H. D. Lamb.

Spaeth, E. B. Etiology of retinal separation considered from the standpoint of surgical correction. *Arch. of Ophth.*, 1938, v. 20, Oct., pp. 1046-1070.

This ophthalmologic review includes discussion of history, etiology, retinal tears, mechanics of the formation of retinal tears, retinal separations from direct traumatism, myopia, inflammatory causes, symptomatic separation, and aphakia and retinal separation. The author concludes that the presence of a retinal tear or of a disinsertion is necessary to the development of retinal separation.

J. Hewitt Judd.

Sugita, Yozo. Further observations on the method of spontaneous retinal detachment, particularly the physicochemical factors in its origin. *Graefe's Arch.*, 1938, v. 139, pt. 3, pp. 561-586.

Physicochemical experiments confirm the author's contention that spontaneous retinal detachment is produced through an increase in osmotic concentration of the fluid vitreous. Water is thereby drawn from the retina, causing it to contract and leading to its detachment. The cleavage products in the fluid vitreous accumulate, according to the Gibbs-Thomson law, at the surface of the vitreous through positive adsorption. By accumulation of the cleavage products upward and temporally, due to centrifugation through movements of the eyeball, retinal tears are most commonly produced in these positions.

H. D. Lamb.

Torres Estrada, Antonio. Vitreous detachment. *Anales Soc. Mexicana de Oft. etc.*, 1938, v. 12, Jan.-July, pp. 151-161.

After eighteen years of blindness from bilateral iridocyclitis with pupillary seclusion, the left eye was operated upon for complicated cataract. After healing, an anterior detachment of the vitreous was found. The author emphasizes the fact that escape of vitreous during cataract extraction predisposes to vitreous detachment.

W. H. Crisp.

Weve, H. J. M., and Fischer, F. P. The clinical value of proteolytic ferments in the subretinal fluid. *Ann. d'Ocul.*, 1938, v. 175, Nov., pp. 807-813.

The authors studied 118 cases of retinal detachment. In 87 percent the subretinal fluid did not contain appreciable quantities of proteolytic ferments which would attack fibrin. Increased proteolysis was present in fresh cases, cases tending to have complications, and cases of disinsertion with cyst formation. Increased proteolysis is not compatible with formation of rigid adhesions, but there is no definite correlation between proteolytic content of the subretinal fluid and the final operative result. The best prognosis is had when the proteolytic activity of the vitreous is normal, that is, just enough to prevent formation of vitreous bands without attacking the adhesive formations between the retina and choroid.

John M. McLean.

Weve, H. J. M., and Fischer, F. P. Deterioration of albuminoid substances in the detached retina. *Ann. d'Ocul.*, 1938, v. 175, Nov., pp. 823-828.

The subretinal fluid contains not only ammonia but amines, derived from retina or choroid. In the detached retina

there is a deterioration of albuminoid substances. Since the oxygen consumption does not correspond to proteid combustion, the deterioration must be by proteolysis. This appears to be related to anatomic lesions in the retina, particularly the tear. Toxicity of the subretinal fluid seems to be due to substances which arise following the alteration in metabolism. The normal retina, which performs glycolysis far in excess of oxidation, presents neither albuminoid deterioration nor proteolysis. Thus it is seen that detachment, although curable, produces serious changes in the vital processes of the retina.

John M. McLean.

Weve, H. J. M., and Fischer, F. P. The importance of p_H in the proteolytic activity of the subretinal fluid and its inhibition. *Ann d'Ocul.*, 1938, v. 175, Nov., pp. 813-816.

The p_H of subretinal fluid falls with the duration of the detachment. There is no correlation between the proteolytic capacity of the subretinal fluid and its p_H , but there is a correlation between inhibition of proteolysis and p_H . As the p_H falls, proteolysis is increasingly inhibited, and this explains the decreased activity in old detachments.

John M. McLean.

Weve, H. J. M., and Fischer, F. P. Metabolism of the detached retina. *Ann. d'Ocul.*, 1938, v. 175, Nov., pp. 817-823.

Normal retina in contact with its pigment epithelium has a very low oxidation-reduction potential (maximum of r_H 16 to 18). Detached retina is strongly oxidized (r_H 21 to 25.5). This oxidation is due to alteration in metabolism, with respiration, not glycolysis, predominating. Glycolysis is

only possible when the retina is in contact with its pigment epithelium. Detachment interrupts contact, with consequent oxidation, inactivation of the glycolytic ferment, and loss of vision. Reattachment reverses this process.

John M. McLean.

Wynkoop, E. J., and Hadley, L. Schüller-Christian's disease. *Arch. of Pediatrics*, 1938, v. 55, July, p. 417.

The authors report a case in a child two years and nine months old, with the classical symptoms of bony defects in the skull, diabetes insipidus, and exophthalmos. The authors noted improvement in the condition when X-ray therapy and proper diet were used.

Theodore M. Shapira.

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Carroll, F. D., and Goodhart, Robert. Acute alcoholic amaurosis. *Arch. of Ophth.*, 1938, v. 20, Nov., pp. 797-803.

Four cases of total but temporary blindness associated with acute poisoning due to ethyl alcohol are reported. All were characterized by total blindness in both eyes, normal pupillary reaction to light and convergence, normal fundi, and rapid improvement after withdrawal of alcohol. The reasons for considering this disease as a manifestation of acute poisoning with ethyl alcohol are discussed, and evidence is presented to show that methyl-alcohol poisoning among addicts is of rare occurrence. Addiction is probably a prerequisite. Although infrequent, this disease demands correct etiologic diagnosis because of the excellent prognosis as compared with the poor prognosis in cases of blindness due to methyl-alcohol poisoning. J. Hewitt Judd.

Heim, H. Therapy in tabetic optic atrophy. *Wiener med. woch.*, 1938, Nov. 12, p. 1196.

After a short review of the literature, the author tells of many cases in which after treatment with iodine there was no progress in the atrophy after many years.

Theodore M. Shapira.

Hill, T. R. Some aspects of neuromyelitis optica. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 143.

A case report is given and conclusions from other cases are cited, to show that progressive bilateral retrobulbar neuritis is not uncommon in disseminated sclerosis. It is possible to find practically identical cases with all degrees of combination of signs and symptoms, between neuromyelitis optica and disseminated sclerosis. The author concludes that progressive bilateral retrobulbar neuritis is a special type of disseminated sclerosis, the "neuromyelitic type."

In discussion Gordon Holmes felt that classification should depend rather on the pathologic conditions underlying the cases, and that with this in mind the two conditions could be differentiated by modern cytopathologic methods.

Beulah Cushman.

Kampmeier, R. H., and Jones, E. Optic atrophy in pernicious anemia. *Amer. Jour. Med. Sciences*, 1938, v. 195, May, p. 633.

The authors discuss three cases of pernicious anemia with optic atrophy. The diagnosis of tabes dorsalis had previously been made in two of the cases. The authors have decided that optic atrophy in pernicious anemia is an intrinsic degeneration rather than directly due to ischemia. Early recognition

of visual disturbances in anemia is essential.

Theodore M. Shapira.

Ridley, Harold. Aplasia of the optic nerves. *Brit. Jour. Ophth.*, 1938, v. 22, Nov., pp. 669-671.

The rare condition reported herein occurred in an only child aged one year, observed in Rupert Scott's clinic at the Royal London Ophthalmic Hospital. The history shows no ocular defect in either paternal or maternal lines. No further defect, mental or otherwise, existed in the case, although such deformities have been noted in the few similar cases recorded. In the case here reported, while the pupils were inactive to light they varied in size unaided by stimulus. The media were clear, the fundi peculiar (illustrated), the red reflex pale with the choroidal pattern well marked. The eyes were quite normal as to anterior appearances. A deep excavation occupied the place of the optic disc, and from its base minute threads representing retinal vessels were all that emerged. A trace of blood, which faded out after leaving the edge of the excavation, was observed in the lower branch of the right eye only. This is stated to be the only case of its kind on record except one in a cat, in which only one eye was abnormal. (Illustrations, references.)

D. F. Harbridge.

Waldmann, Béla. Parallel study of the pathogenesis of rhinogenous optic neuritis and of serous iritis. *Amer. Jour. Ophth.*, 1939, v. 22, Jan., pp. 44-53.

Wexler, D., and Last, M. Coloboma of the optic nerve and of the macula; a microscopic study. *Arch. of Ophth.*, 1938, v. 20, Nov., pp. 787-796.

The authors review the literature and report the case of a woman aged 40

years in whom the right eye revealed a hypertensive retinitis and the left highly myopic eye presented a coloboma of the optic nerve. The eye was removed six hours after death from hypertensive and renal disease, and was sectioned serially. The anomaly was found to be essentially a coloboma of the nerve at its entrance, the nerve being replaced by rudimentary retinal tissue. Associated with this were persistence of remnants of the hyaloid system, widening of the scleral canal, dislocation of the lamina cribrosa, and a choroidal macular coloboma. While the presence of rudimentary nerve tissue may indicate ingrowth of primary retinal layers into the optic stalk, no microscopic explanation could be found for the relation of the undifferentiated nerve to the widening of the optic canal and distortion of the associated structures. J. Hewitt Judd.

Wolff, Eugene. Some aspects of the anatomy of the optic nerve-head. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 70.

An interesting color plate of a section of the optic nerve-head, stained with Mallory's phosphomolybdic-acid and hematoxylin, shows the connective tissue formation of the posterior portion of the lamina cribrosa and the glial structure of the more anterior fibers. The "central connective-tissue sheath" and the intermediary tissue of Kuhnt are discussed, as well as the blood supply of the disc.

Beulah Cushman.

12

VISUAL TRACTS AND CENTERS

Aliquò-Mazzei, Alessandro. Ocular manifestations in tumors of the cranial base of pharyngeal origin. *Boll. d'Ocul.*, 1938, v. 17, March, pp. 180-194.

A man of 51 years was affected by intense pain in the territory of the right trigeminus, internal deviation of the right eye from paralysis of the abducens, anesthesia of the cornea, and neuroparalytic keratitis of two months duration. The radiographic examination showed opacity of the sphenoid bone and disappearance of the foramen ovale. A woman of sixteen years showed the following symptoms: severe neuralgic pain in the territory of the left trigeminus nerve, total ptosis of the left upper lid, total ophthalmoplegia (chemosis, and central ulcer of the cornea with complete anesthesia of the cornea and of the territory of the first and second branches of the trigeminus. Radiographic examination showed slight opacity of the sphenoid with dilatation of the foramen ovale. There was atrophy of the optic disc. A woman of 47 years complained of acute pain of the left side of the face, ptosis of the left upper lid, paralysis of all the external muscles, and anesthesia of the first and second branches of the trigeminus. Radiographic examination showed deep erosion of the sphenoid bone. The writer discusses symptomatology, course, diagnosis, pathology, and therapy, the diagnosis lying in some cases between neoplasm and a basal meningitis of luetic or tuberculous origin. (Bibliography.)

Melchior Lombardo.

Allen, T. D., and Carman, H. F., Jr. Homonymous hemianopsic paracentral scotoma. *Arch. of Ophth.*, 1938, v. 20, Nov., pp. 846-849.

The literature is reviewed and the case of a woman aged 48 years presenting this condition is reported. This type of defect, not so rare as formerly believed, is characterized by sudden onset of a defect in the visual field in persons

otherwise healthy, complaints of difficulty with reading and fixation, normal ophthalmoscopic findings, unaltered visual acuity, and good prognosis as to visual acuity. The condition may be easily overlooked unless a careful history is obtained and perimetric examination made of the central fields.

J. Hewitt Judd.

Bujadoux. Transitory reflex monocular blindness following artificial pneumothorax. *Bull. Soc. d'Ophth. de Paris*, 1937, May, p. 334.

There was loss of the superior field within thirty minutes and complete blindness in five days, with retention of consensual pupillary reflex. There were no fundus changes except slight pallor of the disc. The fields and vision slowly improved, so that two months later the only abnormality was a small paracentral scotoma. The possibility of a reflex retrobulbar angiospasm causing edema of the optic nerve is suggested.

Harmon Brunner.

Kalt, Puech, and Kreba. A case of optic chiasmal arachnoiditis following a contusion without wound in the region of the right upper lid. *Bull. Soc. d'Ophth. de Paris*, 1937, May, pp. 291-298.

An arachnoiditis of the chiasm which developed into a serous meningitis. Vision in the right eye was affected within 24 hours; after three months it was reduced to 0.2. An intermittent absolute scotoma and an absolute paracentral scotoma which later became constant developed in the right eye. Four months after onset, vision in the left eye fell to 0.2 with a relative central scotoma, symmetric with that of the right eye, giving bitemporal paracentral scotoma. Surgery gave prompt

improvement in vision. One year from onset the only sequelae were a small paracentral absolute scotoma in each field and a relative central scotoma in the right eye, reducing vision to 0.4. Prompt surgical intervention is stressed.

Harmon Brunner.

Lemoine, A. N. Lesion of the optic tract, probably the result of infected sphenoid sinuses. *Arch. of Ophth.*, 1938, v. 20, Dec., pp. 966-973., also *Trans. Amer. Ophth. Soc.*, 1938, v. 36.

A man aged 39 years had developed hypertrophy of the prostate at the age of 33 years, and impotency at the age of 37 years. Administration of anterior pituitary extract was followed by improvement, but a lesion of the right optic tract developed and progressed to complete loss of central vision in 21 days. The vision was temporarily improved by the use of ephedrine in the nose. After the sphenoid-sinus disease was corrected by operation, the vision and field rapidly improved to normal. At operation the right sphenoid sinus, which was anomalous in that it extended into the posterior clinoid process back of the optic chiasm, was found to have a hemorrhagic area on the posterior wall. Its close proximity to or possible contact with the superior portion of the right optic tract was thought responsible for the retrobulbar neuritis at this point.

J. Hewitt Judd.

13

EYEBALL AND ORBIT

Brain, W. R. Neurological and general medical causes of exophthalmos. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 27.

The causes of exophthalmos are reviewed.

Cashell, G. T. W. **Case of proptosis due to carcinoma of the antrum.** Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 1, p. 48.

A case report is given from a series of eighteen cases, four of which had carcinoma of the antrum. It is concluded that in this group proptosis meant involvement of the ethmoid cells, secondary to orbital cellulitis, and that the prognosis was good if radium therapy was instituted early, but bad if proptosis was present.

Beulah Cushman.

Cawthorne, Terence. **Ear, nose, and throat aspects of the differential diagnosis of the causes of exophthalmos.** Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 1, p. 19.

Pathologic conditions of the ear, nose, and throat may produce exophthalmos either by causing increase in the orbital contents or by reducing the size of the orbit. The latter may occur either from foreign material being forced into the orbit, from interference with venous return, from extension of inflammation, or from invasion by new growth. Final diagnosis must always be greatly influenced by the radiographic report. Beulah Cushman.

Doggart, J. H. **Differential diagnosis of proptosis in children.** Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 1, p. 32.

The eye and orbit at birth and during childhood being smaller relatively than in the adult, proptosis appears earlier, and the eye itself is more distensible. Increased contents of the orbit will cause prominence, as increased size of the eye in myopia, buphthalmia, or cystic tumors. Inflammatory exudates or hemorrhages from injury or blood

dyscrasias may cause prominence. Tumors involving the orbit or its contents are not uncommon in children. Graves's disease is very uncommon but does occur. Weakened support of the eyeball may be a factor, or diminution of orbital volume as in oxycephaly.

Beulah Cushman.

Ellison, J. **Arteriovenous aneurysm.** Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 1, p. 43.

Three cases are reported. In the first, arising out of a motorcycle accident, ligation of the internal carotid stopped pulsation and bruit, but the eye later showed retinal hemorrhages of thrombotic origin. In the second case, a tine of a pitchfork had passed between the eyeball and the orbital wall. Ligation of the internal carotid produced relative recovery, although the bruit could still be heard on auscultation. In the third case, due to a fall from a bicycle, the aneurysm ruptured, and the patient died after artificial respiration had been maintained for many hours following ligation of the common carotoid.

Beulah Cushman.

Griffith, A. D. **Pulsating exophthalmos after injury.** Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 1, p. 41.

In 20,000 admissions to the surgical wards of Westminster Hospital two cases of pulsating exophthalmos after head injury were included. One case report followed a motorcycle accident in which multiple fractures occurred including fracture of the base of the skull. After temporary ligation of the left internal carotid, pulsation of the eyes ceased at once and the exophthalmos began to recede. The artery was ligated permanently three days later, and the patient recovered.

Beulah Cushman.

Hayes, W. M. Collapse of glass eyes. *Industrial Med.*, 1938, v. 7, Dec., p. 734.

The author reviews the literature and reports a case. He shows that the eye collapses and does not explode, and that it is the posterior, concave portion that gives way.

George A. Filmer.

Knapp, Arnold. Orbital hyperostosis; its occurrence in two cases of meningioma of the skull. *Arch. of Ophth.*, 1938, v. 20, Dec., pp. 996-1005. also *Trans. Amer. Ophth. Soc.*, 1938, v. 36.

The literature is reviewed with special reference to tumors of the sphenoid ridge and tumors of the sylvian cleft. In the first case reported there was unilateral bony deformity with exophthalmos, no changes in the optic nerve in the early stage, and slight paresis of the external rectus muscle. The meningioma involved the squamous portion of the temporal bone, the large wing of the sphenoid bone, and the outer and upper walls of the orbit. The eye was enucleated and as much as possible of the mass in the orbital cavity was removed. After nearly two years the bony swelling measured about 8 by 6 by 4 mm. The pain was relieved entirely by roentgen treatment. In the second case the meningioma apparently originated at the temporal half of the fissure of Sylvius and involved the greater wing of the sphenoid bone and the temporal part of the lesser wing, extending to the anterolateral part of the frontal and the anterior part of the temporal bone. The patient was given roentgen treatment and the process remained stationary. Whether this was due to the roentgen treatment could not be determined. (Photomicrographs.)

J. Hewitt Judd.

MacCallan, A. F. Differential diagnosis of the causes of exophthalmos. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 50.

By the use of pathologic distinctions the author considers acute inflammatory exophthalmos under the headings of simple orbital edema, orbital subperiosteal abscess, and orbital cellulitis.

Beulah Cushman.

Moore, R. F. Differential diagnosis of causes of exophthalmos. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 3.

The author analyzed 117 consecutive cases of proptosis as to bilaterality, direction of proptosis, palpation of orbital contents, limitation of movements, chemosis, traumatic causes, callus formation, hemorrhage into the orbital cavity, inflammatory causes, Graves's disease, dermoid cysts, benign tumors, tumors of the optic nerve and its sheath, primary malignant growths, metastatic growths, arteriovenous aneurysms, thrombosis in the cavernous sinus, and the proptosis of oxycephaly.

Beulah Cushman.

Pochin, E. E. Lid-retraction and exophthalmos in Graves's disease. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 39.

In comparing the apparent exophthalmos of Graves's disease with proptosis the author found that retraction of the upper lid was frequently present without exophthalmos and the lower lid stood at a slightly higher level relative to the cornea before prominence could be measured. In one case this was true for a year before the exophthalmos could be measured. In other cases of Graves's disease there was no lid retraction but a measurable exophthalmos. Thus the author concludes that

exophthalmos and lid retraction in Graves's disease give an illusion of exophthalmos. Both widen the palpebral fissure, exophthalmos widening it downward and exposing sclera below the cornea, while lid retraction widens it upward, exposing sclera above the cornea.

Beulah Cushman.

Rushton, R. H. The clinical measurement of the axial length of the living eye. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 136.

The author used the shadow cast by a metal object between an X-ray tube and the eye, because such a shadow is visible in the dark with the closed eye after dark adaptation. The principle is to find the distance between retinal X-ray perception at the posterior pole and a ribbon of light passing tangentially to the cornea in a plane exactly parallel with that at the posterior pole. A suitable piece of apparatus was demonstrated.

Beulah Cushman.

Whiting, M. H. Orbital meningo-encephalocele. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 58.

Anterior encephaloceles emerge between the ethmoid and frontal bones at the expense of the horizontal plate of the ethmoid. In the orbit they pass between the frontal process of the frontal bone, the lacrimal bone, the cribriform plate of the ethmoid, and the nasal process of the superior maxilla. Posterior encephaloceles emerge between the sphenoid and the frontal bone on either side of the lesser wing of the sphenoid. Parsons' classification of cysts of the orbit is given. He calls encephalocele an inclusion cyst of congenital origin.

A number of case reports are in-

cluded. Operative interference terminated fatally in a number of instances, from subsequent meningitis. The presence of pulsation transmitted from the cranial cavity, and the occurrence of pressure symptoms such as restlessness, vomiting, and slowing of the pulse on compression of the tumor, are given as the clearest indications of the nature of an encephalocele.

Beulah Cushman.

Wolfe, C. T. Congenital bilateral anophthalmos. *Kentucky Med. Jour.*, 1938, v. 36, July, p. 279.

Wolfe presents a case of this rare anomaly in a nine-year-old child. Etiology and history did not suggest a reasonable cause.

Theodore M. Shapira.

14

EYELIDS AND LACRIMAL APPARATUS

Cornet, Emmanuel, Dacryocystorhinectomy (a new technique). *Ann d'Ocul.* 1938, v. 175, Nov., pp. 842-845.

The operation follows the Dupuy-Dutemps technique until the nasal mucous membrane is exposed. Then a large window is cut out of the mucosa and a corresponding window from the side of the lacrimal sac. The edges are joined with two continuous catgut sutures forming a circular anastomosis. The nasolacrimal duct is curetted and the skin and canthal ligament are closed in the usual manner.

John M. McLean.

Focosi, M. Malformations from persistence of the oblique fissure of the face. *Boll. d'Ocul.*, 1938, v. 17, April, pp. 255-269.

A girl of sixteen years showed an anomaly of the left side of the face. The internal canthus was about 7 mm.

lower than the right one. The palpebral fissure, instead of being horizontal, was oblique. There was ectropion of the margin of the lid in its nasal portion, with eversion of the lacrimal punctum. There was also a deepening of the nose-chin line, and the left ala nasi appeared to be 1.5 cm. higher than the right. Etiology and pathogenesis are discussed, and plastic surgery for the condition is described. (Bibliography, 5 figures.) Melchior Lombardo.

Fonseca, Aureliano. The Marcus-Gunn syndrome. *Rev. de Oft. de São Paulo*, 1938, 6th yr., April-June, pp. 92-100.

Description of a case of jaw-winking, with discussion of its anatomic basis. W. H. Crisp.

Guy, Loren. Simple dacryocystorhinostomy. *Arch. of Ophth.*, 1938, v. 20, Dec., pp. 954-957.

The incision is made from a point 3 mm. above the inner canthal ligament downward and outward, just nasal to the anterior lacrimal crest, and is carried down to the bone through the periorbita. The latter is then elevated temporally, exposing the lacrimal fossa and the sac. In the lower half of the fossa a window about 4 by 6 mm. is made by means of a chisel, a pair of scissors, or a curette. The nasal mucous membrane and the corresponding portion of the sac wall are excised, the tissues allowed to fall back into their natural position, and held in place by a pressure bandage. No sutures are used. Of the 54 patients operated on by this method, fifty were relieved both of epiphora and of empyema of the sac. One failure was due to faulty technique and one resulted from nasal obstruction due to neglected sinus disease. J. Hewitt Judd.

Michail, D., Vancea, P., and Zolog, N. Investigations on the lacrimal elimination of glucose. *Bull. de l'Acad. de Méd. de Roumanie*, 1938, v. 5, no. 2, p. 182.

Glucose is not normally eliminated in the tears, but is found in the tears of diabetics, and during the course of alimentary and adrenalin hyperglycemia. In the former two conditions, there is no relation between the amount of glucose excreted and the blood-sugar level, while the contrary seems to be true in the latter condition. George A. Filmer.

Nicholls, J. V. V. A case of granuloma of the lacrimal canaliculus. *Canadian Med. Assoc. Jour.*, 1938, v. 39, p. 569.

A pea-sized tumor surrounding the upper canaliculus in a 60-year-old woman was removed and studied pathologically. Because of its microscopic appearance and the presence of some old conjunctival scars, the lesion was assumed to be of a trachomatous nature. (Illustration.)

George A. Filmer.

Rabinowicz, M. G. Chronic bilateral dacryoadenitis. *Viestnik Ophth.*, 1938, v. 13, pt. 1, p. 112.

In a woman of nineteen years, enlargement of the lacrimal glands was associated with enlargement of the thyroid. The diagnosis was made by biopsy. The tissue was excised from the lids, with complete recovery.

Ray K. Daily.

Raverdino, Emilio. A turbinotome for dacryocystorhinostomy "ab externo." *Rassegna Ital. d'Ottal.*, 1938, v. 7, July-Aug., pp. 499-503.

The author describes an instrument for biting off a portion of the turbinate

in the external operation of dacryocystorhinostomy. It is a forceps, curved in a slight S-shape, its ends cup-shaped, 7 by 4 mm. The edges are only slightly sharpened. The plane of the spoon-shaped end of the instrument is parallel to the plane of the handles. The author finds numerous uses for the instrument in the operation mentioned. (3 figures.)

Eugene M. Blake.

Smith, J. W. **Blepharitis comb.** Arch. of Ophth., 1938, v. 20, Oct., pp. 658.

For removing the densely adherent scales in ulcerative blepharitis a comb has been devised which consists of eight metallic needles 3 mm. long, covering a width of 3 mm.

J. Hewitt Judd.

Thurel, Robert. **The motor disturbances of the lids.** Arch. d'Ophth. etc., 1938, v. 2, Sept., p. 795, and Oct., p. 897.

After discussing the physiology of the lid movements the pathology of lid motility is gone into at great length. The various headings and subheadings are: paralysis of the orbicularis (of peripheral and central origin), paralysis of the levator, hypertonic retraction of the upper lid, involuntary movements, and blepharospasm (of peripheral and central origin). The article does not lend itself to abstracting.

Derrick Vail.

Tomkevich, A. I. **Late results of external dacryocystorhinostomy.** Viestnik Ophth., 1938, v. 13, pt. 3, p. 388.

A review of the literature and an analysis of the author's own material, which consisted of 414 operations, with 96.14 percent final satisfactory results. In the author's experience recurrences appear within the first few months after

the operation, and he urges that patients be kept under observation for six months.

Ray K. Daily.

Valière-Vialeix. **Additional cases of chronic conjunctivitis provoked by mycelian infections in the lacrimal canaliculi.** Bull. Soc. d'Ophth. de Paris, 1937, May, p. 298.

Reports of two proved cases which presented as chronic monocular conjunctivitis. The author gives the characteristic symptoms as: conjunctivitis predominating at the inner canthus, with folliculosis in chronic cases; abundant stringy conjunctival secretion; and itching at the inner angle. The canaliculi could be irrigated. The cases were resistant to conjunctival medication. The treatment is careful curettage after incision of the canaliculus.

Harmon Brunner.

White, J. P., Michaelson, I. C., and Heggie, J. F. **Tumor of lacrimal sac of cellular mixed parotid type, associated later with tumor of parotid region of same histological character.** Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 1, p. 159.

A mass in the region of the left lacrimal sac, which had increased in size after sixteen years, was removed. The growth was hard and fibrous, but no disease of the bone or other structures was noted. A course of deep X-ray therapy was given. Four months later a swelling was found at the upper pole of the parotid, and because of enlargement it was removed two months later. Histologically the tumors were similar. Each had a thin capsule and was moderately vascular. The intimate relation of stroma and cells characteristic of mixed parotid tumors was observed in both tumors.

Beulah Cushman.

15

TUMORS

Angius, Tullio. Lymphangioma of the limbus. *Rassegna Ital. d'Ottal.*, 1938, v. 7, July-Aug., pp. 538-542.

The author reviews our knowledge of this rare tumor of the eye. Many believe it is congenital, for it often increases rapidly at puberty. Trauma may play a part. He reports an instance of the condition in a man of 63 years. One year before Angius saw the patient a small growth had appeared at the limbus of the right eye. After eight months this was removed but no study was made of it. The growth recurred within four months and increased rapidly. Microscopic study showed a collection of oval spaces, lined by endothelium and separated by connective tissue septa. There was some infiltration by polynucleated cells. Fibroblasts were found in the septal positions. The growth raised the corneal epithelium but did not invade Bowman's membrane. (2 figures.)

Eugene M. Blake.

Bietti, Giambattista. Precocious choroidal metastases of latent primary carcinomas and their diagnostic problems. *Boll. d'Ocul.*, 1938, v. 17, March, pp. 163-179.

A man of 65 years had an intraocular tumor which upon microscopic examination was found to be carcinoma. The same symptoms developed in the other eye a year later. A woman of 32 years was affected by symptoms of intraocular tumor of the left eye, which was found to be a carcinoma of the choroid. The same symptoms manifested themselves in the other eye, which was found to contain the same type of tumor. Both these patients passed away with abdominal symptoms. In

both cases the two eyes became affected by a tumor which appeared to be metastatic, and before the metastases the patients had not noticed any subjective general disturbances, nor did the clinical and laboratory examinations reveal the localization of the original focus of the neoplasm. The diagnostic difficulties are discussed. (Bibliography, 6 figures.)

Melchior Lombardo.

Braun, Reinhard. Chaoul's concentrated-fractional roentgen near-radiation of malignant tumors of the lids. *Klin. M. f. Augenh.*, 1938, v. 100, Oct., p. 557.

Chaoul's method combines the advantages of application of radium with those of soft roentgen rays. Eleven cases are reported, three unfavorable. Good results are obtained with sufficient dosage. The danger from radiation is reduced if a nickel-plated lead prosthesis is used for protection of the healthy surroundings.

C. Zimmermann.

Braun-Vallon. A case of optic-nerve tumor. *Bull. Soc. d'Opht. de Paris*, 1937, May, pp. 287-290.

A three-year-old child had deviation of the right globe downward, exophthalmos, and unilateral papilledema, with roentgen signs of enlargement of the optic foramen. Exploration revealed an encapsulated tumor encircling the optic nerve. This was resected, leaving the globe. The pathologic diagnosis was meningoblastoma, type sarcomatous with involvement of the optic nerve. It is considered as a slowly progressive benign growth rarely involving cranial portions of the optic nerve.

Harmon Brunner.

Dupuy-Dutemps. Tumor of the choroid. Liver metastasis eight years

after enucleation. *Bull. Soc. d'Opht. de Paris*, 1937, May, p. 284.

Case report of a 33-year-old male whose left eye was enucleated for melanosarcoma of the choroid. Invasion of the sclera but no perforation was found on microscopic examination. Observation over five years showed no local or general return. Two photomicrographs compare sections of the primary and metastatic tumors. Another case is cited with metastasis nine years after enucleation.

Harmon Brunner.

Herman, P. Melanotic sarcoma of iris associated with congenital anomaly. *Bull. Soc. d'Opht. de Paris*, 1937, no. 3, March, p. 164.

Report of a case of melanoma occurring in a heterochromic iris on a large, presumably congenital ectopia. (2 photomicrographs, pathologic report.)

Harmon Brunner.

Keller, P. Glioma of the retina at Tonkin, thirteen observations histologically confirmed. *Arch. d'Opht. etc.*, 1938, v. 2, Sept., p. 813.

Various statistics give the frequency of retinal glioma as 6.8 per 100,000, 17 per 100,000, 10 per 100,000. The author reports a frequency at Tonkin of 26 per 100,000, 23 percent of the cases being bilateral. Of the thirteen cases reported, in six the tumor had broken through the eyeball and fungated externally between the lids. Five showed ocular hypertension of rapid evolution, generally present at the end of two months after the condition was first recognized. Enucleation or evisceration was performed in all except two of the cases. After the stage of hypertension is reached radiation treatment does not work. None of the cases gave a history of heredity. (Illustrations.)

Derrick Vail.

Lijo Pavia, J. The formation of retinal folds by pressure on the globe from an orbital tumor. *Rev. Oto-Neuro-Oft.*, 1938, v. 13, May, p. 122. (See *Amer. Jour. Ophth.*, 1938, v. 21, Sept., p. 1068.)

Radnot, Magda. Carcinoma of the meibomian glands. *Ophthalmologica* (formerly *Zeit. f. Augenh.*), 1938, v. 95, Oct., p. 22.

In a 59-year-old man, a resistant thickening of the lid occurred and gradually increased in size in the course of seven months. Histologically it proved to be a medullary carcinoma. Tumors of the meibomian gland are very rare and are more often adenoma than carcinoma. The rare carcinoma may be very malignant, and may recur, metastasize, and cause death.

F. Herbert Haessler.

Rosenbaum, H. D. Sarcoma of the iris. *Amer. Jour. Ophth.*, 1938, v. 21, Dec., pp. 1360-1364.

Sédan, Jean. Recurrence of epithelioma of the limbus, with large independent palpebral and corneal attachments. *Ann. d'Ocul.*, 1938, v. 175, Nov., pp. 829-836.

Ten years ago an epithelioma of the limbus and adjacent cornea had been excised but not irradiated. Eight years later a similar mass arose from the palpebral conjunctiva, and later it bridged across to become attached at the site of the former tumor on the cornea. The two attachments were entirely independent, for a probe could be passed under the tumor mass between these two areas. Excision was again practised.

John M. McLean.

Sgrosso, S. Diagnosis of metastatic carcinoma of the eye. *Rassegna Ital. d'Ottal.*, 1938, v. 7, July-Aug., pp. 439-498.

The author describes minutely four cases of metastatic carcinoma of the eye, in two of which there were bilateral manifestations. A third case was monocular and the fourth was probably localized in the optic nerve behind the globe. The ages of three patients were between 50 and 60, while one was only 38 years old.

The literature is carefully reviewed and the different phases of the subject fully discussed. The author found 258 cases reported, 70 percent of which were in females. The age most frequently affected is between 50 and 60 years. The tumor reaches the eye through the blood stream and lodges in the choroid. Approximately 25 percent of the cases are bilateral, and when both eyes are affected there is usually only a short interval of time between them. Metastasis in the eye occurs anywhere from one to two years after the primary growth is discovered. The first symptom is usually loss of vision or defect in the visual field. Commonly the ocular growth is in the posterior portion, usually near the disc and more often on the temporal side. The tumor is flat and ovoid at first, the color yellowish gray. The tension is not raised except late in the disease. In differential diagnosis one must consider simple detachment, sarcoma, and irritative glaucoma. (5 colored figures.)

Eugene M. Blake.

Shepkalova, V. M. Diktyoma of the retina. *Viestnik Opht.*, 1938, v. 13, pt. 1, p. 95.

Clinical and histopathologic report of a case in an eight-year-old girl. This malignant tumor arises from embryonic retina. Histologically it is differentiated from glioma by its mitoses, which are placed on the free surface of the cellular layer, away from connective tissue

and blood vessels. In glioma the mitoses are located basally. Ray K. Daily.

Torres Estrada, A. Dermoid cyst of the orbit penetrating to the anterior cerebral fossa. *Anales de la Soc. Mexicana de Oft.*, etc. 1937, Oct., Nov., and Dec., pp. 105-108.

The patient was a woman of 62 years. Since the first years of her life she had had a small induration between the upper orbital margin and the left eye, toward the outer end of the eyebrow. The growth had increased in size since the age of 45 years. The eyeball was greatly displaced forward, downward, and inward. Puncture of the tumor showed a thick yellowish oily liquid, without suppuration. After incision above the eyebrow and separation of the ocular tissues from the orbit, the growth was found to be of the size of a small orange. The roof of the orbit had undergone destruction, and the growth had penetrated into the anterior cerebral fossa, pushing before it the dura mater. After evacuation of the fluid, the sac was dissected out. The eyeball returned to its normal position.

W. H. Crisp.

16

INJURIES

Berezinskaja, D. I. The rôle of paracentesis in the treatment of chemical ocular burns. *Viestnik Opht.*, 1938, v. 13, pt. 3, p. 361.

A report of a laboratory study on rabbits. The conclusions are that repeated paracentesis is helpful in moderately severe alkali burns, and in severe corneal burns provided the conjunctiva was not destroyed. In necrosis of the conjunctiva paracentesis is helpful only in conjunction with mucous-membrane transplantation. Ray K. Daily.

Bonnet and Bonamour. **An unusual case of cataract caused by electrocution.** Bull. Soc. d'Opht. de Paris, 1937, May, p. 333.

Three months afterward, the patient had a superficial anterior cortical cataract of the left eye with vision of 0.5. Six months later a posterior cortical cataract developed and reduced vision to 0.02. The need for guarded prognosis in these cases is stressed.

Harmon Brunner.

Ciotola, Guido. **Two cases of double rosette cataract.** Rassegna Ital. d'Ottal., 1938, v. 7, July-Aug., pp. 504-520.

The author cites two cases of rosette cataract, which were unusual in that the rosettes were doubled; that is there was an anterior subcapsular rosette-shaped opacity and also a similar one in the posterior subcapsular region. Both cases occurred in young men and resulted from rather severe contusions. The development of the opacities is explained as forming about the original Y-shaped figures, with extensions to bundles of fibers attached to the sutures. In all about 150 such cases have been described. The literature is reviewed and cases abstracted. (4 figures.)

Eugene M. Blake.

Denig, Rudolph. **Indications for immediate transplantation of buccal mucous membrane for eye burns.** Med. Record, 1938, v. 148, Dec. 7, p. 395.

Immediate surgical treatment of the majority of eye burns by mucous-membrane transplantation is urged by the author. He shows that burns, even if some distance removed from the cornea, may damage the capillaries of the limbus and interfere with the nutrition of the cornea. Excision of limbal conjunctiva with transplantation of buccal mucous membrane results in formation

of new capillaries, hyperemia, and increased diffusion of nutritive material into the corneal tissue. (Illustrations.)

George A. Filmer.

Disler, H. H. **Rosette-shaped traumatic cataract.** Viestnik Opht., 1938, v. 1, p. 5.

From a study of traumatic opacities, the course of which is recorded by drawings, the author divides the lenticular traumatic manifestations into immediate, secondary, and late. The primary changes are associated with injury to the lens capsule and lens substance, appear at the site of injury, and consist in destruction of lens fibers and edema. They may be arrested at any point of their development and may regress to some extent. The pathogenesis of secondary lenticular changes is less clear. They are usually in the form of rosette-shaped cataracts which may completely regress. Late opacities may appear months after the injury and usually proceed to complete opacification. The author's group of opacities, appearing after injuries not involving the lens, are characterized by their persistence. Five posterior ring-like opacities and one anterior-capsular opacity showed no change during a period of observation extending over several months. Two cases with posterior and anterior subcapsular opacities were practically without change for three weeks. In none of these cases was there a rosette-shaped opacity.

Ray K. Daily.

Dollfus, M., and Borsotti, I. **Experimental study of tolerance to intraocular foreign bodies of rustless steel or non-magnetic alloys.** Arch. d'Opht. etc., 1938, v. 2, Oct., p. 911.

From their clinical and experimental observations the authors reach the fol-

lowing conclusions: (1) The presence of an oxidizable metal, iron, steel, or copper, within the eye provokes by its chemical nature a severe disorder which leads to rapid loss of vision and irremediable retinal lesions. (2) Rustless steel, on the contrary, more and more employed in industry, is tolerated like any other inert chemical body, such as glass, within the eye. Siderosis does not result. (3) Every effort must be made therefore to determine the nature of the intraocular metal before operating. If it is rustless steel or non-magnetic alloy it is wiser to refrain from attempting extraction, because experience has shown that the eye supports the foreign body without damage. Such a foreign body is only dangerous by carrying infection or by traumatic lesions it may have provoked. (Illustrations, bibliography.)

Derrick Vail.

Filippov, H. A. Electromagnetic service. *Viestnik Ophth.*, 1938, v. 13, pt. 2, p. 276.

The author urges mass production of giant and hand electromagnets for the purpose of equipping all ocular dispensaries with them. Ray K. Daily.

Goldberg, H. K. Iodism with severe ocular involvement. *Amer. Jour. Ophth.*, 1939, v. 22, Jan., pp. 65-68.

Hartmann, Karl. The question of ocular lesions from sulphuretted hydrogen. *Klin. M. f. Augenh.*, 1938, v. 101, Oct., p. 510.

Numerous reports show that sulphuretted hydrogen damages the corneal epithelium primarily (not by the way of the blood and respiration), causing a superficial punctate keratitis, with complete recovery after a few days. As deviating from this, the author has previously described a case of typical

keratitis with complete loss of sensibility, a combination not hitherto mentioned in the literature. A similar observation was made by Kiel in a caisson worker, with subsequent scars of the cornea and vision 8/10 after several months. Experiments in rabbits proved that 0.1 per 1000 of sulphuretted hydrogen might after prolonged action produce superficial and also deep keratitis. In the numerous cases of acute and subacute poisoning by sulphuretted hydrogen described in the literature, ocular affections are never mentioned. Such a case of severe acute poisoning without ocular involvement is now presented.

C. Zimmermann.

Jacqueau and Dumas. Subconjunctival hemorrhage from strangulation. *Bull. Soc. d'Ophth. de Paris*, 1937, May, p. 341.

Strangled by a neckerchief caught in transmission gears, the patient suffered no immediate aftereffects. Twenty-four hours later he developed a tremendous ecchymosis of the entire conjunctiva, a moderate ecchymosis beneath the surrounding skin, and slight exophthalmos. The reason for delay in development of the hemorrhage is discussed.

Harmon Brunner.

Kalt, M. E. The harmful action on the retinal pigment epithelium of certain solutions containing iodides and injected parenterally. *Bull. Soc. d'Ophth. de Paris*, 1937, May, p. 304.

Following reports of pigmentary degeneration from massive parenteral injections of fortified Pregl's solution (Septoid), the author reports a series of animal experiments. Believing sodium iodate (NaIO_3) to be the active agent, he injected a 4-percent solution into gray rabbits and produced, as injections were continued, retinal edema

and pigment spots of different forms and degrees. Histologic sections showed pigment cells invading the retina, and greater dosage caused retinal and choroidal degeneration. No other ocular lesions were observed. (5 illustrations, 4 references.)

Harmon Brunner.

Kaplan, I. D., and Lapidus, A. M. Occupational acrichinin keratitis. *Viestnik Opht.*, 1938, v. 13, pt. 3, p. 409.

Workers in factories producing this product develop, in addition to symptoms of general intoxication, a keratitis characterized by edema, erosions, and a greenish-yellow discoloration of the cornea. Relief from the subjective symptoms is rapid, but the discoloration and corneal dullness may remain for two months. Ray K. Daily.

Kochkongov, M. I. A serous cyst of the iris. *Viestnik Opht.*, 1938, v. 13, pt. 2, p. 268.

A report of a case which developed fifteen years after an injury.

Ray K. Daily.

Kolen, A. A., and Triumfov, A. V. A rare case of hysteria. *Viestnik Opht.*, 1938, v. 13, pt. 1, p. 38.

After a fall from a moving train a woman had paralysis of the third and sixth nerves. Soon afterward she developed severe pain in the left eye, relieved only by pressure on the eyeball. On release of pressure the pain extended over the entire head and the patient became ataxic. When the patient again presented herself at the hospital two years later, the left eye was in a state of enophthalmos, atrophy, and hypotony. With constant pressure over the left eye the patient had no complaints, but release of pressure brought on severe pain and ataxia. The patient

begged to have the left eye enucleated, and recovered promptly after the operation. The author considers the patient's difficulties hysterical, and attributes the hypotony, enophthalmos, and atrophy of the left eye to the prolonged continuous pressure. Ray K. Daily.

Lijo Pavia, J. Traumatic hole at the macula and detachment of the vitreous. *Rev. Oto-Neuro-Oft.*, 1938, v. 13, p. 154.

A thirteen-year-old boy sustained a macular hole from a blow on the eye. The foveal lesion was first noticed one month after the injury. Six months after the injury the author noted detachment of the vitreous between disc and fovea. The evolution of both macular and vitreous changes is described in great detail. A discussion of macular holes and the factors which may produce them is appended. (Illustrations.)

Edward P. Burch.

McAlester, A. W., III. Gonioscopy as an aid to localizing small foreign bodies in the anterior chamber. *Amer. Jour. Ophth.*, 1938, v. 21, Dec., p. 1380.

McDonald, Robb. Carbon disulphide poisoning. *Arch. of Ophth.*, 1938, v. 20, Nov., pp. 839-845.

The author reviews the literature and presents the results of his studies of 120 workers employed in a rayon industry where they had been exposed to carbon disulphide for a long time. Many showed systemic signs of chronic intoxication, and 75 percent of those examined had some ocular complaint. The most significant early ocular sign was enlargement of the blind spot. Diminution of the corneal reflex was found in over one half of the workers. Diminution of the pupillary reaction to light was the second most common finding. The ocular signs of carbon-

disulphide poisoning are essentially those of a systemic neurologic disturbance. No cases of rayon keratitis were seen.

J. Hewitt Judd.

Makhlin, I. M. Injury to the eye from eyebrow and eyelash dyes. *Viestnik Opht.*, 1938, v. 13, pt. 2, p. 271.

A report of three cases, two of which were promptly cured by irradiation with Bucky's border rays. The author urges supervision of beauty parlors and of the sale of the dyes.

Ray K. Daily.

Plitas, P. S. Occupational ocular injury with a bobbin from a weaving machine. *Viestnik Opht.*, 1938, v. 13, pt. 3, p. 412.

A blow on the eye by a bobbin flung from a weaving machine is among the most serious occupational injuries. It should be entirely eliminated by industrial prophylaxis. Within the last four years the author has seen thirteen such injuries, in nine of which the eyes were finally enucleated. The vision of the four cases in which the eyeballs were saved was 0.7, 0.1, 0.02, and 0.001 respectively.

Ray K. Daily.

Teulières, M., and Beauvieux, J. Post-traumatic pearl cyst of the iris. *Arch. d'Opht. etc.*, 1938, v. 2, Aug., p. 706.

As a rule traumatic penetration of a cilium into the anterior or posterior chamber leads to a severe inflammatory reaction. Occasionally, however, the cilium may be well tolerated and after a long time become encysted, resulting in so-called "pearl cyst" of the iris. A case is described in which such a cyst developed within a year after a perforating steel injury and retention of a cilium in the anterior chamber. The rapid evolution is explained by proliferation of the ectodermal cells of the

ciliary bulb, or by corneal cells being drawn into the anterior chamber at the time of the accident. (Illustrations, bibliography.)

Derrick Vail.

Tichvinskii, B. T. The use of egg membrane in plastic operations on the eyeball. *Viestnik Opht.*, 1938, v. 13, pt. 3, p. 397.

The author uses eggshell membrane to prevent development of symblepharon in chemical burns and in recurrent pterygium. He emphasizes the importance of suturing the membrane in the desired place.

Ray D. Daily.

Woschke, Joachim. Retinal detachment and accident. *Klin. M. f. Augenh.*, 1938, v. 101, Oct., p. 587.

Accidental detachment may occur after perforating injuries, from formation of holes and tears in the retina, from intense loss of vitreous and later inflammation followed by formation of cyclitic pseudomembranes, even long after the injuries. It may also occur after direct contusion of the eyeball if a tear of the retina is produced, or after indirect contusion of the globe by impact on the skull or whole body (by formation of retinal tears). Another cause is excessive bodily exertion.

C. Zimmermann.

17

SYSTEMIC DISEASES AND PARASITES

Brückner, A. Physiologic and clinical ophthalmologic problems in relation to individual variability. *Arch. of Ophth.*, 1938, v. 20, Oct., pp. 541-568; Nov., pp. 726-756; and Dec., pp. 913-953.

The reactions of different individuals to normal and abnormal stimuli vary within a wide range. The individual variability is based on the constitution as determined by heredity. Persons with extreme degrees of insufficiency

are able to exist at low intensities of light only with the protection which human civilization affords. The author reviews the theories of color sense and discusses the dependence of color sensation on the stimulus. Recent findings support the hypothesis of Hering that the peripheral nerve endings respond to stimulation by the production of chemical substances of antagonistic character, acetylcholine and epinephrine.

Congenital color deficiencies are discussed under the topics of partial color blindness, anomalous trichromates, diagnosis and frequency of different types of color deficiency, heredity of color deficiency, total color blindness, and the development of color sense. The phenomena of local adaptation are discussed with reference to the phenomena of revulsive local adaptation, including black sensation and the importance of contrast; local differences in adaptation, especially as to measurement of this phenomena; the phenomenon of constancy; and the seat of local adaptation.

The third section discusses normal and pathologic light and dark adaptations and variation in the relative thresholds, the various factors causing individual variation, and the diseases accompanied by disturbances of dark adaptation. The individual variabilities found by clinical methods are discussed under the headings of focal illumination, tonometry, and sensitiveness of the cornea. Under diseases of the eye dependent on constitution, the author discusses tuberculous diseases of the eye and scrofula of the eye. The diseases of the eye discussed in relation to weather and climate are hordeolum, catarrhal ulcer of the cornea, acute conjunctivitis, herpes corneae, scrofula of the eye, and acute glaucoma.

J. Hewitt Judd.

Caramazza, F. Experimental tuberculosis of the eyeball from inoculation with attenuated bacilli of human tuberculosis. *Boll. d'Ocul.*, 1938, v. 17, March, pp. 133-152.

The author injected into the anterior chamber of one eye and the vitreous of the other eye of four rabbits an emulsion of human tubercle bacilli in different concentration. One rabbit was injected in one eye with tubercle bacilli while the other eye had been inoculated some time before with the aqueous of another rabbit affected by active tuberculosis. The inoculation in the anterior chamber was followed by no reaction at the beginning, and the presence of tuberculous formations in the iris and ciliary body was noted as a late manifestation. The inoculation in the vitreous was followed by a slight diffuse inflammatory process, with foci of exudate between choroid and retina and later in the anterior uveal tract. At a still later stage the specific character was lost. This is taken as a demonstration of the natural tendency to exhaustion of the tuberculous process due to the action of the natural powers of defense. The rabbit which was inoculated with tubercle bacilli while the other eye was affected by a tuberculous process showed Koch's phenomenon, namely, the development of an acute reaction leading to panophthalmitis. (Bibliography, 11 figures.)

Melchior Lombardo.

Chesney, A. M., Woods, A. C., and Campbell, A. D. Observations on the relation of the eye to immunity in experimental syphilis. *Jour. Exper. Med.*, 1939, v. 69, Jan. 1, p. 163.

It is known that second inoculations of homologous strains of *Treponema pallidum* made after the ninetieth day following the original infection are not

followed by a secondary infection, an acquired resistance having apparently been set up. In this investigation, syphilitic rabbits were allowed time to develop an acquired immunity, as shown by the fact that one control group failed to develop lesions following intracutaneous injection of infective material. Injections into the cornea or anterior chamber, however, resulted in lesions in 62 percent of the animals tested, although showing a longer incubation period than in control animals. The authors conclude that in the syphilitic rabbit the eye does not participate to the same extent as other tissues in the general resistance which develops during the course of the infection. (Illustrations.)

George A. Filmer.

Elles, N. B. Bilateral accommodation paralysis and unilateral scotoma in sphenoidal-sinus disease. *Amer. Jour. Ophth.*, 1938, v. 21, Dec., pp. 1365-1369.

Hoshi, K. The influence of some toxins producing ocular changes on the morphologic blood-picture in rabbits. *Graefe's Arch.*, 1938, v. 139, pt. 3, pp. 553-560.

Curves are presented to show the effect on the number of red blood cells and the number with polychromasia in each of five or six rabbits after intravenous injection of nephrotoxin, hepatotoxin, and septon, respectively.

H. D. Lamb.

Jones, L. T., Jordan, L. W., and Sullivan, N. P. Intraocular nematode worms. *Arch. of Ophth.*, 1938, v. 20, Dec., pp. 1006-1012.

The authors review the literature and report a case in which the living adult form of a nematode, measuring about 9 mm. in length and 0.2 mm. in diameter, was found attached to the iris of a

patient who had never been in a tropical country. The worm was lost at the time of removal and an exact classification could not be made. The appearance of the eye is shown in a drawing.

J. Hewitt Judd.

Rosenzweig, M. G. *Cysticercus* in the subcutaneous tissues of the orbit. *Viestnik Opht.*, 1938, v. 13, pt. 2, p. 270.

The parasite was found in a cyst excised from the orbit. Ray K. Daily.

Savin, L. H. Remarks on ophthalmic gout. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 149.

After a historical review of ocular lesions associated with the diagnosis of gout, four case reports are given. The following points are emphasized in diagnosis of the gouty diathesis: a history of acute attacks, including some history of provocative factors; family history; the presence of tophi; increase of blood uric-acid in attacks; lessened excretion of uric acid in the urine; X-ray evidence of typical punched-out areas in the bones of an affected joint; and the response to treatment with colchicum.

Beulah Cushman.

Shapiro, E. A. Treatment of ocular complications of malaria with iodoquinopyrin and novocaine blocking. *Viestnik Opht.*, 1938, v. 13, pt. 1, p. 107.

A review of the clinical material thus treated demonstrates the effectiveness of this therapeutic combination.

Ray K. Daily.

Walsh, F. B. Facial hemiatrophy. *Amer. Jour. Ophth.*, 1939, v. 22, Jan., pp. 1-10.

Clin. Oft. e Oto-Rino-Laring., 1937, 4th year.

This thorough review of the subject, apparently presented to the second Brazilian Congress of Ophthalmology, deals with the steps taken in all the important countries of the world, summarizes the statistics available as to the incidence of blindness (varying from 3.7 per 10,000 in Belgium to 166.7 per 10,000 in Palestine), and closes with a bibliography of 136 references.

W. H. Crisp.

Alvaro, M. E. Scientific organization of ophthalmologic work. *Rev. de Oft. de São Paulo*, 1938, 6th yr., April-June, pp. 79-91.

The organization of clinical work is discussed, with special mention and illustration of a double chair (both parts adjustable as to height) for doctor and patient in the work of refraction.

W. H. Crisp.

Alvaro, M. E. Twentieth International Congress of Ophthalmology. *Rev. Oto-Neuro-Oft.*, 1938, v. 13, Jan., pp. 3-9.

A brief commentary on the Cairo Congress.

Bab, W. S. Blindness passed unobserved for many years. *Jour. Nervous and Mental Dis.*, 1938, v. 88, Sept., pp. 327-329.

The author reports the case of a 21-year-old idiot who, he believes, had been blind for many years from an optic atrophy without the parents or the attendants observing the fact.

T. E. Sanders.

Bazshenova, M. A. Tissue culture of animal ocular structures. *Viestnik Opht.*, 1938, v. 13, pt. 3, p. 355.

A review of the literature and a re-

port of the author's own investigations on the eyes of adult rabbits. She found that the ocular tissue of the adult rabbit grows as well in vitro as tissues of the embryo and the new-born.

Ray K. Daily.

Best, Harry. The problem of statistics relating to blindness and the blind. *Amer. Jour. Opht.*, 1938, v. 21, Dec., pp. 1376-1379.

Borges Dias, Artur. Ocular examinations in aviation candidates. *Rev. de Oft. de São Paulo*, 1938, 6th yr., April-June, pp. 67-75.

A statement of the necessary tests, in Portuguese.

Denig, E. P. Considerations on the present diffusion of trachoma in Cordoba. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, April, p. 182.

The article consists chiefly of a statistical analysis. The author reaches the conclusion that about 2.7 percent of the population of the province are affected, but that the disease is decreasing in incidence. Edward P. Burch.

Esser, A. M. Ascetic self-blinding. *Klin. M. f. Augenh.*, 1938, v. 101, Oct., p. 580.

Quotations from the legends of ascetic self-inflicted destruction of the eyes in Christian and Indian cultures show common traits, while absence of this psychologic phenomenon in antiquity illustrates the difference of mentality of these groups.

C. Zimmermann.

Ferree, C. E., and Rand, G. Prescribing light. An important factor in the care and treatment of the eye. *Brit. Jour. Opht.*, 1938, v. 22, Nov., pp. 641-668.

It is the opinion of the authors that, in comparison with other branches of medicine, the use and progress of hygienic measures in the care and treatment of the eye have been overlooked to the point of undue neglect. The subject of hygiene is therefore dealt with in this lengthy article (not lending itself well to abstract) under the following headings: important structural and functional conditions, outstanding features in lighting in relation to examination and care of the eye, means for improving lighting conditions, examination of the eye in relation to lighting, intensity of light and strength of reading glasses. The prescribing of light to meet the needs of individual persons is now a practical possibility, and it is the feeling of the authors that, when properly used, such practice will be of definite service. (References.)

D. F. Harbridge.

Friedenwald, Harry. The services of the Jews to ophthalmology. *Acta. Ophth. Orientalia*, 1938, v. 1, Sept., pp. 36-48.

This is a comprehensive review of the part played by Jewish physicians in the field of ophthalmology since the Arabic period. Many familiar names of workers of the middle ages and of recent centuries are briefly referred to. The history of modern ophthalmology in Europe includes the names of Hirschberg, Magnus, Stilling, Axenfeld, Bernheimer, Salzmann, Hirschmann, Laqueur, and Javal. Among prominent American Jewish ophthalmologists may be mentioned Hays of Philadelphia, Gruening of New York, and Koller (discoverer of the anesthetic properties of cocaine).

W. H. Crisp.

Gorovaja, K. G., and Rappaport, M. K. Ocular findings in the military candidates of 1914-1916 in the Minsk district. *Viestnik Opht.*, 1938, v. 13, pt. 3, p. 333.

The report shows a yearly decline in the incidence of trachoma and ocular injuries.

Ray K. Daily.

Levy and Bailliart. Trembling of field glasses. *Bull. Soc. d'Opht. de Paris*, 1937, no. 3, March, p. 177.

There is a normal, constant, and physiologic tremor which may become accentuated in various states of muscle tension. This limits the magnification useful in hand-supported glasses.

Harmon Brunner.

Rakusen, C. P. History of Chinese spectacles. *Chinese Med Jour.* 1938, v. 53, April, pp. 379-390.

The history of the use of glass and spectacles in China is reviewed. The author concludes that, although there is good evidence that the Chinese made use of glass as early as 200 B.C. and that the use of rock crystal goes back to prehistoric times, the history of the use of spectacles in China is still obscure and it is possible that spectacles may have been introduced into China rather than developed there.

T. E. Sanders.

Row, D. H., and Chadwick, C. D. Causes of blindness in Indiana. *Amer. Jour. Ophth.*, 1939, v. 22, Jan., pp. 57-64.

Vila Ortiz. Necessity of regulating the visual efficiency of transportation employees, and the medicolegal evaluation of industrial eye accidents. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, April, p. 195.

The author makes a plea for the establishment by governmental decree of visual standards for individuals engaged as drivers in transportation services, including operators of motor vehicles and airplanes. He gives in

tabular form the standards proposed for the various categories. He stresses the fact that defects considered unimportant in other lines may be of considerable importance in drivers of vehicles.

Edward P. Burch.

NEWS ITEMS

Edited by DR. H. ROMMEL HILDRETH
640 S. Kingshighway, Saint Louis

News items should reach the Editor by the twelfth of the month

DEATHS

Dr. Anton Schwartz Schneider, Plattsburg, New York, died November 19, 1938, aged 48 years.

Dr. Benjamin Franklin Baer, Jr., Philadelphia, died December 19, 1938, aged 59 years.

Dr. Oscar Merle Shirey, Cleveland, Ohio, died November 20, 1938, aged 60 years.

MISCELLANEOUS

Approximately 15 percent of all blindness can be traced to syphilis, says the National Society for the Prevention of Blindness in a statement urging widespread public observance of National Social Hygiene Day on Wednesday, February 1.

"The venereal diseases—syphilis and gonorrhea—are among the major destroyers of sight," the statement points out. "For that reason, we have a special interest in the efforts to control these diseases, and we are glad to cooperate with the campaign sponsored by the American Social Hygiene Association.

"The importance of this problem may be realized from the fact that about 60,000 babies are born with congenital syphilis every year. Most of them develop a serious eye condition at some time in early life, unless they receive adequate medical care.

"Prenatal syphilis is preventable if the expectant mother who is infected begins treatment in the early months of pregnancy. The Society advocates a routine blood test for every expectant mother, because such a test can usually determine the presence of syphilitic germs.

"The compulsory use of prophylactic drops in the eyes of all babies at birth has brought about a marked reduction in the amount of blindness from gonorrheal infections; and a great decrease in the amount of blindness from prenatal syphilis can be achieved also.

"In industry, too, the eye hazards are greater when workers are suffering from syphilis. The

presence of this disease increases the severity of eye injuries; a little cut or bruise of the cornea, that would otherwise pass unnoticed, may develop into a serious condition if the worker is suffering from syphilis.

"The consequent lowering of sight to a point of economic blindness carries with it the full indemnity for complete loss of vision; and the courts have held that the existence of syphilis does not lessen the responsibility of the insurance carrier unless it can be definitely shown that the loss of sight would have progressed even if the injury had not occurred."

The National Society for the Prevention of Blindness has announced that Lewis H. Carris, managing director, assumed the title of general director on January 1, with Mrs. Winifred Hathaway as associate director. Mrs. Eleanor Brown Merrill, an associate director for the past five years and formerly secretary of the Society, becomes executive director, and will relieve Mr. Carris of administrative details. John M. Glenn, one of the founders of the National Society for the Prevention of Blindness, has been elected an honorary vice-president.

The Department of Ophthalmology at the University of California, a year ago, received the sum of \$40,000 for the establishment of the Charles Taylor Reeve Foundation in Ophthalmology. Just recently, with Mrs. Reeve's death, an additional \$30,000 has been added to this fund. The interest from this combined fund is for the study and treatment of diseases of the eye.

The Seventeenth Annual Summer Graduate Course in Ophthalmology and Otolaryngology, Denver, Colorado, is announced for July 24 to August 5, 1939. The Denver Graduate Course, pioneer of its kind in the country, was originally conceived to supply a two-fold need of instruction and summer recreation. This year it is intended to make the work even

more attractive by bringing a larger number of guest instructors and adding evening lectures to the curriculum. The evening lectures will be delivered by prominent and qualified leaders in the allied specialties, who will bring the latest information in their fields as it relates to ophthalmology and otolaryngology. For further information write Dr. Harry L. Whitaker, 1234 Republic Building, Denver, Colorado.

Mr. L. Vernon Cargill, November, 1938, opened the reconstituted pathological and research department of the Royal Eye Hospital. The foundation of the department 50 years previously was pointed out, and the good work done there. The new extension will increase the possibilities of the department.

SOCIETIES

The Ophthalmological Society of the United Kingdom will convene at the Royal Society of Medicine on April 20, 21, 22, 1939. The subject for discussion will be "The problems of refraction." The Bowman Lecture will be delivered by Professor Weve on "Diathermy in ophthalmic practice." The International Organization against Trachoma and the International Association for the Prevention of Blindness will hold their annual meetings on April 19, 1939.

The Puget Sound Academy of Ophthalmology and Otolaryngology announces the following officers: Dr. J. Edward Clark of Seattle, president; Dr. W. A. Cameron of Tacoma, vice-president; Dr. Purman Dorman of Seattle, secretary-treasurer.

The Eye Section of the Philadelphia County

Medical Society, presented the following program on February 2, 1939: Sarcoma of stump of the iris eight years after iridectomy with cataract extraction, by Dr. Maxwell Herman; Iritis due to gout, by Dr. Jacob Reber; Mirror writing in school children, by Dr. M. E. Smukler. Discussions were given by Dr. Samuel Bruck and Dr. Samuel J. Goldberg.

PERSONALS

Miss E. E. Cass has been appointed Hon. Ophthalmic Surgeon to the New Sussex Hospital for Women and Children at Brighton, while Mr. Joseph Minton has been elected Assistant Ophthalmic Surgeon to the West End Hospital for Nervous Diseases.

At a dinner meeting of the Cleveland Ophthalmological Club, held November 1, 1938, the guest speaker was Dr. Ramon Castroviejo of New York City. Dr. Castroviejo gave a most instructive and illuminating talk on "Plastic surgery of the cornea." The lecture was illustrated with beautiful lantern slides and moving pictures.

Dr. Gilbert Patterson of Santa Rosa, California, announces the removal of his office to 1116 Mendocino Avenue.

Dr. Hans Barkan of San Francisco has recently returned from a four months' trip abroad. A good deal of his time was spent in Switzerland, where he made some interesting observations.

Dr. Otto Barkan of San Francisco has recently returned from an extended trip abroad, most of his time having been spent in the Scandinavian countries.

LECTURES ON MOTOR ANOMALIES*

VIII. PARALYSIS OF INDIVIDUAL EYE MUSCLES: ABDUCENS-NERVE PARALYSIS

A. BIELSCHOWSKY, M.D.

Hanover, New Hampshire

By far the most frequent isolated paralysis of an ocular muscle is that of the external rectus. It is due to the fact that the abducens nerve has a longer course on the base of the skull than both the other motor nerves of the eyes, and is exposed to injuries more than the others, particularly where it passes around the apex of the petrosal portion of the temporal bone. In recent abducens pareses the diagnosis is easily made from the restriction of the outward ocular movement, the uncrossed diplopia due to the convergent position of the visual lines, and the increase and decrease of the separation of the double images according to whether the eyes are moved either to the paretic or the other side. But exceptions to the typical behavior occur rather frequently and may render the diagnosis more difficult. These may be caused by different factors; first, by the behavior of the antagonist of the paretic muscle which, as was mentioned before, may or may not develop a secondary contracture and change the typical features of the paretic deviation in such a way that they become more or less similar to a nonparetic strabismus.

Sometimes one encounters cases which display all the symptoms of an abducens-

nerve palsy, with the sole exception that the homonymous double images are not on the same level and that they are slightly inclined toward one another. This may be due either to a complication of the abducens-nerve palsy with a concomitant hyperphoria or paresis of one of the vertical motors, or the muscle plane of the external rectus may not coincide with the horizontal meridian of the eye. One may assume the last-mentioned factor to be the cause if the vertical and rotary components of the deviation are rather small in comparison with the horizontal component, and if only the latter increases or decreases in the typical manner according to the direction of gaze. The other components of the deviation may represent a subordinate (secondary) function of the paretic muscle and its antagonist, due to their asymmetrical adjustment to the eyeball. The secondary contracture of the antagonist will either outlast the paresis if it is based on an organic change of the structure of the internal rectus, or it may represent only a transitory stage if the deviation is based on an increased tonus of the internal rectus; if it subsides gradually, the deviation will decrease until binocular vision is restored.

The congenital deficiencies of abduction need special discussion because of their rather frequent occurrence and the peculiarities they present when compared with ordinary pareses of the abducens

*From the Dartmouth Eye Institute, Dartmouth Medical School. Read before the Seventh Annual Mid-Winter Clinical Course of the Research Study Club, Los Angeles, California, January, 1938.



Fig. 26 (Bielschowsky). Congenital deficiency of abduction. A, in looking straight ahead no deviation whatever, binocular single vision. B, the left eye does not respond to the levoversion impulse. C, retraction syndrome takes place in dextroversion: high degree of enophthalmos and narrowing of the palpebral fissure of the left eye.

nerve. The main characteristics of congenital deficiencies of abduction are as follows:

1. In more than 60 percent of the cases, a total lack of abduction is to be found in the left eye, in 16 percent it is in the right, and in 24 percent in both eyes.

2. Sixty percent of the patients are of the feminine sex.

3. Besides the lack of abduction there is a deficiency of adduction in 50 percent

4. In spite of a complete lack of abduction the majority of the patients have binocular single vision owing to an habitual turning of the head to the side of the deficient abduction.

5. There is a striking contrast between the unilateral total lack of abduction and the very small paralytic deviation which, in many cases, is hardly noticeable, even when the head and gaze are in the primary position. Only exceptionally, one meets with extremely high deviations due either to a maximal contracture of the internal rectus muscle, or to the presence of abnormal fibrous tissue in the place of that muscle and fixing the eye in a strongly adverted position (fig. 27).

6. In most cases diplopia is absent, due either to unilateral amblyopia, which occurs not infrequently or—much more frequently—to binocular single vision, which is achieved by the habitual (vicarious) position of the head, the movement of which makes up for the absent movement of the eye.

7. In quite a few cases the congenital deficiency of the lateral movements is combined with an upward deviation that takes place when an impulse to an adversion is given, just as has been described in the discussion of the so-called overaction of the inferior oblique. In some cases of the former group a faulty development of the internal rectus has been found. Its tendon was divided into two branches, one being inserted in the



Fig. 27 (Bielschowsky). Extremely high deviation in a case of bilateral congenital deficiency of abduction due to abnormal tissue in place of the internal recti muscles.

of the cases. The deficient adduction is combined, as a rule, with a more or less marked retraction of the eyeball and a narrowing of the palpebral fissure ("retraction syndrome"). (Fig. 26.)

horizontal meridian but behind the equator so that it acted as a retractor bulbi, while the other branch was inserted in the upper half of the sclera near the insertion of the superior rectus.

8. Most striking features are presented

been found in patients who had been operated upon. In most of them the deficiency of the ocular movement was due to a faulty development or a complete absence of the muscles. In place of the external rectus was found a nonelastic

Fig. 28 (Bielschowsky). Congenital bilateral deficiency of abduction combined with bilateral facial paralysis. A, no paralytic deviation in the primary direction of gaze. B, Bell's phenomenon most impressive.



by patients with a congenital bilateral deficiency of abduction and bilateral facial paralysis. Bell's phenomenon as well as the complete immobility of the face are most impressive (figs. 28A, B and 29A, B, C).

9. In many of these congenital deficiencies of ocular movements other congenital anomalies have been ascertained:

fibrous band, either without any or with only very few muscle fibers. Its incapacity, both to relax and to contract, and, furthermore, the resistance it offers to the contraction of the internal rectus accounts for some of the characteristics of the congenital anomalies such as the missing, or very small paralytic deviation; the lack or insufficiency of adduction; and



Fig. 29 (Bielschowsky). Same anomaly as shown in previous figure. A, no deviation in looking straight ahead. B, eyes respond to any lateroversion impulse with a maximal convergence; C, Bell's phenomenon very marked.

either a poor development or a complete absence of the thyroid gland, epicanthus, unusually marked asymmetry of the halves of the face, and other abnormalities.

The peculiarity of the clinical phenomena in cases with congenital deficiencies of ocular movements is to be attributed to anatomic irregularities, which have

the retraction phenomenon. The narrowing of the palpebral fissure in cases with the retraction syndrome is an accessory phenomenon accompanying the retraction of the eyeball to which the lids remain attached. In some cases the external rectus may be found to be fairly normal, while in place of the internal rectus there is a nonelastic band, resisting active as

well as passive outward movement of the eyes, that is held in convergent position without being able to turn in to the normal extent. In other cases of the anomalous

ses, I can state that isolated trochlear palsies occur at least half as often as abducens palsies. Most statistics give too small a number of trochlear palsies, ob-

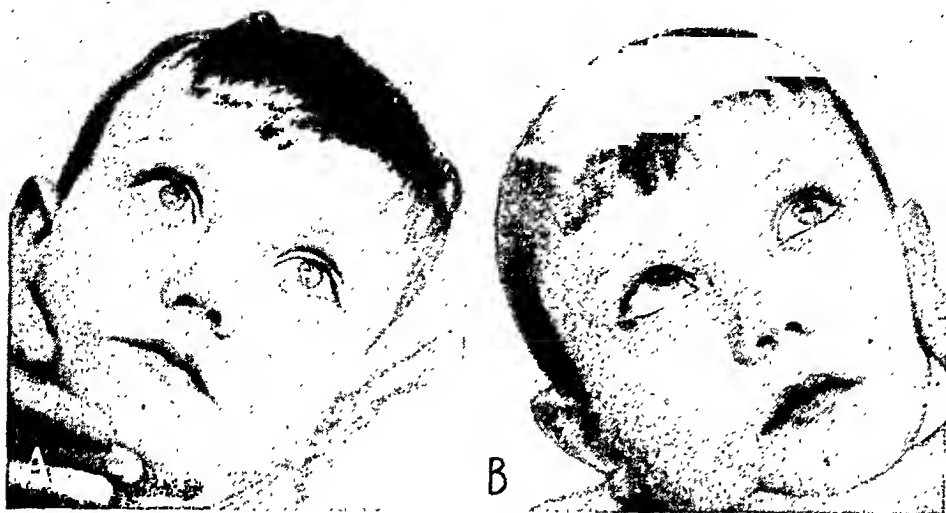


Fig. 30 (Bielschowsky). Torticollis of ocular origin in a case of right trochlear paresis. A, binocular single vision with head tilted toward the left shoulder. B, maximal vertical deviation with the head tilted to the right.

lies under discussion, a faulty development of the motor nerves and their nuclei has either been found—for instance, an aplasia of the sixth and seventh nuclei in cases of congenital bilateral paralysis of the sixth and seventh nerves—or must be assumed.

As to the therapeutic procedures in congenital motor anomalies, there is no need for operation if binocular single vision in the central part of the field of fixation can be attained by a slight turning of the head. In other cases with either a disfiguring paralytic squint or an anomalous position of the head, operations cannot be dispensed with. They will be discussed together with the treatment of paralytic squint.

PARALYSIS OF THE TROCHLEAR NERVE

By far the most frequent and important type of paralysis of a single vertical motor is trochlear-nerve palsy—most important because not infrequently there are variations which lead to a wrong diagnosis. From my material comprising several thousand cases of ocular paraly-

ses, I can state that isolated trochlear palsies occur at least half as often as abducens palsies. Most statistics give too small a number of trochlear palsies, obviously because frequently these palsies are not recognized or are misconstrued. The most striking sign in many cases is habitual torticollis; that is, a tilting of the head toward one shoulder. The ocular origin of torticollis is often not recognized, especially in cases of congenital trochlear-nerve palsy or those acquired in early childhood (fig. 30A, B). The general practitioner or the surgeon who is first consulted about torticollis frequently takes it for a contracture of the sternocleidomastoid muscle, although there is neither a contracture which can be felt nor a resistance to the passive straightening of the head or to its being tilted toward the opposite side.

I have observed many such cases in children who had to endure various kinds of orthopedic treatment for several years, naturally without the least effect. As soon as the physicians or the parents discontinued the forced straightening of the child's head, it was tilted toward the same side as before the treatment. At last the physician advised the parents either to punish the child because of the "bad habit" or to divide the sternocleidomas-

toid muscle. But when the operation was done, the child did not cease to tilt the head, as before. In several cases the child's mother was the first to discover the ocular origin of the position of the head by observing that the child closed one eye during the forced upright posture of the head, whereas both eyes were opened as soon as the child was allowed to keep the head tilted in the habitual way. This observation was correct: The habitual position of the head helped the child to secure binocular single vision, whereas to avoid a disturbing diplopia arising from straightening the head the child closed one eye. These children discard the anomalous position of the head spontaneously as soon as the balance of the vertical motors of the eyes is restored by the required operation, which I shall discuss later.

The ocular origin of this kind of torticollis was first recognized by Cuignet,¹ in 1873; he could not, however, explain the connection between the ocular disorder and torticollis any more than could Landolt² in 1890, in his paper on ocular torticollis. Without knowing the problem under discussion, A. Nagel³ in 1871 had supposed that in cases of slight paresis of an elevator or depressor muscle a vertical and rotary deviation would be caused by tilting the patient's head toward one side, a supposition based on the discovery that a parallel rotation of the eyes around the visual axis is produced by tilting the head towards the opposite side. As we now know, parallel rotation of the eyes is due to a reflex innervation of vestibular origin. The parallel rotary movement could only be performed, as Nagel presumed, by both the inferior muscles of one eye (inferior rectus and inferior oblique) and at the same time by both superior muscles of the other eye (superior rectus and superior oblique). The combined action of the two superior

muscles as well as that of the two inferior muscles cannot cause a deviation of one of the visual lines provided the two muscles of each pair are equally strong, for in that case the antagonistic components of those muscles will compensate each other and there can result neither a vertical nor a lateral deviation of the visual axis. The only effect of the combined action of these two muscles is the rotary movement which they produce in the same direction.

Let it be supposed that in a case of right trochlear-nerve palsy the head is tilted toward the right shoulder. From this will arise a vestibular excitation of those muscles that are able to produce a parallel rotary movement of the eyes to the left. This movement is produced in the left eye by the two inferior muscles, and in the right eye by the two superior muscles. The paralyzed right superior oblique muscle can no longer compensate the elevating and adducting component of the right superior rectus, from which a vertical and a lateral deviation of the right visual line must result, whereas in a normal person both the visual axes would be stationary. And what will happen if the head of the patient with the paretic right superior oblique muscle is tilted toward the left side? Both inferior muscles of the right eye and the superior muscles of the left eye receive the vestibular innervation to rotate the eyes around the visual axis to the right. This movement can be performed without the coöperation of the paretic muscle; hence no deviation of the visual axis will result. As mentioned before, the more the sound muscles are burdened the more favored will be the paretic muscle. Now one can understand the reason for the habitual tilting of the head that is observed in so many cases of trochlear-nerve palsy: If the head is tilted toward the shoulder of the sound side, a coöp-

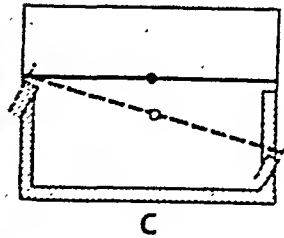
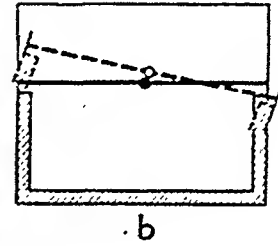
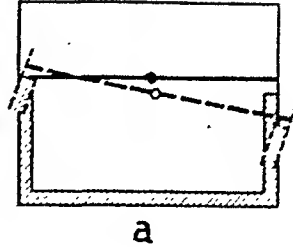
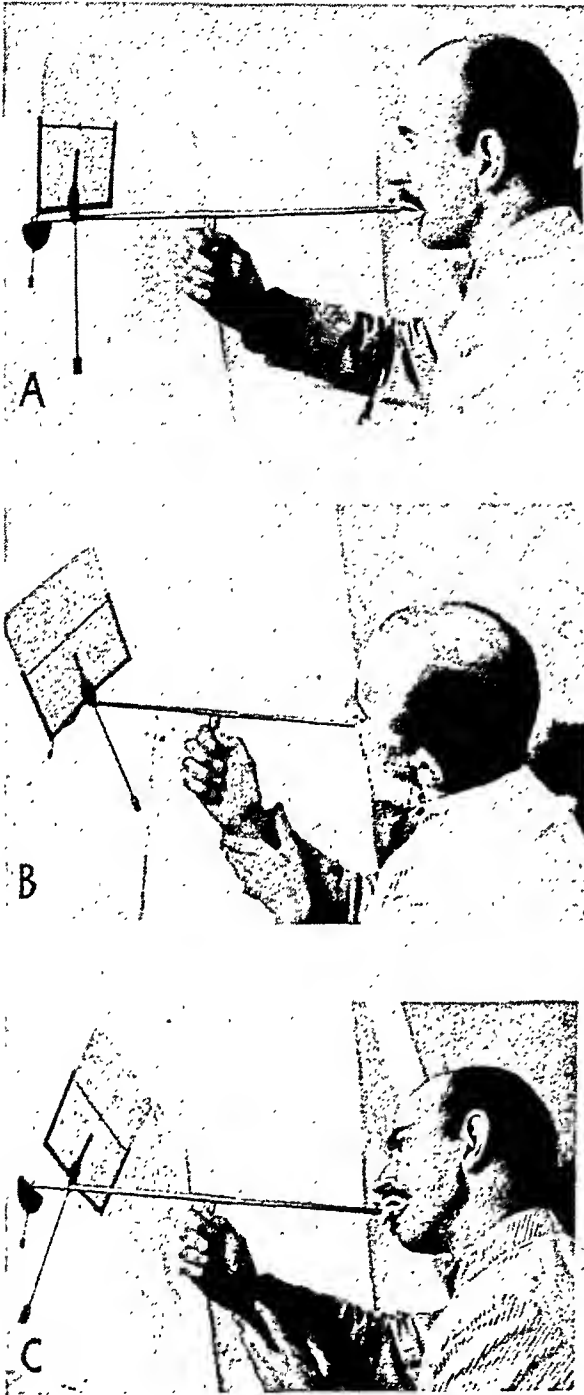


Fig. 31 (Bielschowsky). Head-tilting test in a case of bilateral trochlear paresis. A, while the patient's head is erect, two images of the fixed black stripe are seen, the lower one belonging to the left eye (reproduced to the right of the figure). B, the vertical separation of the two images is increased by tilting the head toward the left shoulder. C, the opposite kind of vertical divergence is brought about by tilting the head toward the right shoulder, which makes the paresis of the right trochlear nerve manifest.

eration of the superior oblique muscle is not called for, so that binocular single vision is obtained.

Nagel's supposition has been proved correct by the investigations made by Hofmann and me⁴ in 1900. In that publication the explanation given by other authors concerning the tilting of the head in cases of trochlear-nerve palsy was discussed and proved wrong. But, strange

to say, that wrong explanation has found currency to this day in many later articles on the subject. It is said that the paretic eye, deviated upward by tilting the head, is depressed as far as necessary to bring both visual axes to the same level, so that the vertical distance between the double images is removed and only a small lateral distance remains, which can be easily corrected by a convergence or divergence

innervation. The error of this explanation can be recognized at once. If a prism of 10 degrees, base up or down, is placed before one eye and the head tilted alternately toward either side, the two images will be seen at the same height, but only in respect to the horizontal plane, so that if an effort is made to converge the double images pass each other without meeting. The direction in which they are moving will deviate from the direction in which they are seen moving with the head erect, by the same angle which the basal line of the eyes—that is, the line between both nodal points—includes with the horizontal.

There is another argument against the wrong explanation just mentioned: In cases of nonparetic vertical divergence or of paresis of the superior or inferior muscle the tilting of the head does not influence the distance between the two images. Therefore, this peculiar posture of the head will be found only if the balance of the oblique muscles is disturbed, provided that the patient can get binocular single vision at all.

I have not yet been able to find out why the tilting is of no use in palsies of the vertical recti, although these muscles help to bring about rotation of the eyes around the visual axes necessitated by tilting the head toward the opposite side. According to my experience, paresis of the superior or inferior oblique is in all cases at the bottom of ocular torticollis, provided that only by this posture can binocular single vision be obtained.

It may be stated in brief, that in some cases of trochlear-nerve palsy the habitual position of the head differs from the one just described because the patient chooses the most convenient position of the head that relieves the paretic muscle enough to permit binocular single vision. Cases will be encountered in which the head is

turned toward the sound side, so that the visual line of the paretic eye, because it is now turned out, is not acted on by the oblique muscles. A habitually depressed position of the head in cases of trochlear-nerve palsy is seldom encountered.

For an exact investigation of the influence that the position of the head just discussed exerts in certain cases of vertical deviation, one may use a simple apparatus constructed on the principle of Helmholtz's *Visierzeichen* (fig. 31A, B, C). While the patient's head is fixed by his taking between his teeth the little plate at one end of the rod, he looks at a horizontal black stripe on a piece of white cardboard fixed to the other end of the rod 30 inches (75 cm.) away. The rod is put through a short tube, so that when the patient tilts his head it rotates around the same axis and through the same angle as the head. In this way it is insured that the visual line keeps its direction during the tilting of the head, since the cardboard with the fixed stripe keeps pace with the movement of the head, in respect to both the amount and the direction. A patient with a left trochlear-nerve palsy using this little apparatus will see, while his head is erect, two images of the black stripe, the image belonging to the left eye being below the other image and both converging to the left side (fig. 31a). When the head is tilted toward the left shoulder, the vertical distance and the obliquity will increase considerably (fig. 31b), whereas tilting of the head toward the right shoulder makes the two images come to fusion or in a case of bilateral paresis brings about the opposite vertical divergence (fig. 31c).

The deviation caused by a trochlear palsy is made up of several components, the vertical one being the most important in point of diagnostic value. In typical

cases the vertical deviation increases in looking down as well as in looking to the sound side, according to the physiologic function of the superior oblique, which has the main influence on the depression of the eye while the visual line is turned in; whereas, if the latter is turned out, the only effect the superior oblique has on the eye will be an inward rotation of the vertical meridian. Bearing

the latter will appear parallel in the opposite part of the field of fixation where the function of the oblique muscles is confined to the vertical component (fig. 32).

The photograph shows the two images in various parts of the field of fixation in a typical case of trochlear-nerve palsy. The patient is fixating the little lamp in the middle of the tangent scale. By turn-

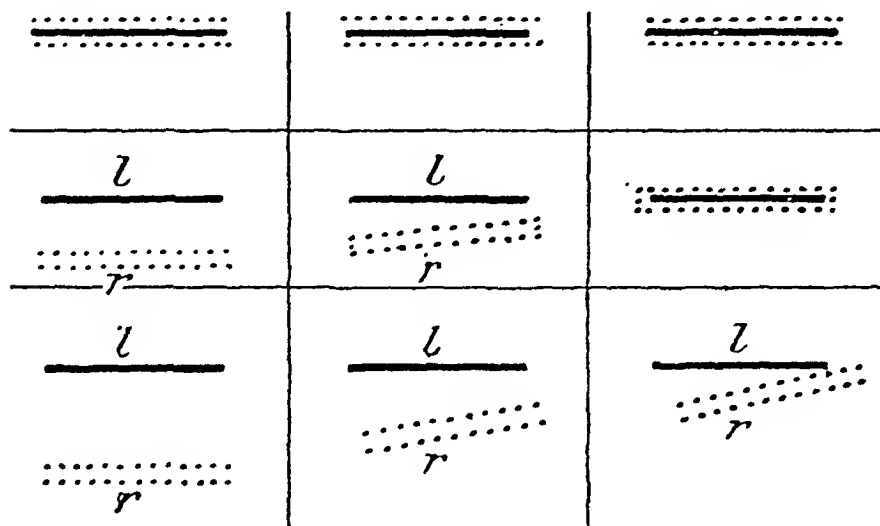


Fig. 32 (Bielschowsky). Double images (*r* and *l*) of a horizontal object in the various parts of the field of fixation, in a case of right trochlear palsy.

this in mind one has to expect that the vertical distance of the double images will increase in looking down because the paretic eye will lag behind, while in looking up there will be the minimum, if any, vertical diplopia. In looking to the sound side, the disturbance of balance between the oblique muscles will become more and more noticeable: The paretic eye will deviate upward under the influence of the inferior oblique which is not, or insufficiently, counterbalanced by its antagonist. In looking to the paretic side, the vertical position of the paretic eye depends less and less on the oblique muscles. Therefore, the vertical deviation will decrease more the more the paretic eye is turned out. But in that position the loss of the rotary component of the superior oblique will bring about the maximum of obliquity of the double images; whereas,

ing the patient's head, while he is ordered to fixate the lamp continuously, his eyes are made to turn to the left side and the right, up and down, up and to the left or to the right, and so on. The measurement of the various components of the deviation obtained in this way is not very exact but is sufficient for the diagnosis and as basis for comparing the results of later examinations with those of the first.

From what was said about the behavior of the paretic deviation in the various parts of the field of fixation, it is easily understood that a patient with trochlear-nerve palsy will instinctively try to bring the objects that attract his attention into that part of the field of fixation where he will see them singly. He can achieve this either by rotating his head around the frontal axis so that the chin is pressed

against the chest, or by turning the head around the vertical axis toward the sound side. In either case, the object looked at may be seen single since the eyes are brought into a position where the paretic muscle is considerably unburdened. A habitually depressed position of the head in cases of trochlear-nerve palsy is very seldom met with because it is rather inconvenient. More frequently, the head is turned habitually toward the sound side so that the patient looks at an object straight in front with the visual line of the paretic eye averted. But this position of the head will be satisfactory only in cases with very slight trochlear-nerve palsy because it does indeed do away with the vertical deviation, but not with the meridional disclination due to which disturbing diplopia, particularly in reading, may remain, double images of the vertical lines crossing each other at acute angles. Hence, the majority of patients with trochlear-nerve pareses will show a habitual tilting of the head toward the shoulder of the sound side, sometimes combined with a rotation of the head around the vertical axis toward the same side. By that position of the head, the paretic superior oblique is unburdened completely and the patients do not feel any discomfort. It goes without saying, that patients with ocular paralysis will demonstrate an anomalous position of the head only if it relieves them of diplopia. If binocular single vision cannot be obtained by any vicarious position of the head or if unilateral amblyopia prevents a disturbing double vision, the head is held in its ordinary position. Sometimes existing anomalous positions of the head are given up if the paretic deviation increases to an insuperable degree.

As in cases of abducens-nerve palsy, not infrequently trochlear-nerve palsy also gradually loses its typical features by the development of a secondary con-

traction of the inferior oblique muscle, the antagonist of the paretic muscle, while the latter is recovering. In such a case the vertical distance of the two images no longer increases on looking down or decreases on looking up. Changes in the amount of vertical divergence take place only when the patient is looking from left to right; the vertical divergence increases in the direction of the sound side and decreases in the opposite direction, whereas the contrary is found with respect to the meridional (rotary) deviation, just as in the first stage of the paresis. Why does the change in the type of the paresis not extend to the influence of the lateral movements on the vertical divergence, so that the deviation becomes concomitant in the whole field of fixation as in abducens-nerve palsy? The influence of the vertical motor muscles on the position of the eye at a given moment depends on the angle between the visual line and the muscle planes of those muscles. If the visual line is abducted, the oblique muscles have no influence on the vertical position of the eye, whereas their influence increases the more the visual line is adducted. These conditions are not altered when an originally paretic vertical deviation is maintained at a later stage only by a contracture of the antagonist of the paretic muscle. If such a case is encountered and the first stage of the paresis is not known, it is difficult to decide whether the deviation is to be connected, for instance, with a palsy of the left trochlear nerve or with a paresis of the right superior rectus muscle. In either case the behavior of the vertical deviation is the same, increasing if the patient looks to the right and decreasing if he looks to the left. The small lateral component does not matter, as was said before. Not even the obliquity of the two images is sufficient for the differential diagnosis, as has been discussed previously.

In such cases the head-tilting test will help to find the origin of a paresis. The patient observes the two images of the black strip on the cardboard screen. If,

described is similar to that anomaly, previously discussed, which gives the impression of excessive functioning of one or both inferior oblique muscles. The



Fig. 33 (Bielschowsky). A, permanent secondary deviation of the normal left eye in a case of right trochlear palsy. B, upon looking down and to the left the right visual line cannot be lowered at all. C, upon looking down and to the right, however, the right eye does not lag behind the left eye.

for instance, the vertical distance between the two images increases when he tilts his head toward the left shoulder and decreases or disappears when he tilts it the other way, one may conclude that the change in the vertical distance is caused by a disturbed balance of the left oblique muscles, the superior oblique being too weak in relation to its antagonist. If in the head-tilting test vertical distance does not show the aforementioned difference, one may take it for granted that the muscles of the left eye are intact, but the right superior rectus muscle is too weak in relation to its antagonist. Since this test has proved to be true in several hundred cases of the palsy under discussion which I saw before the atypical stage developed, I know that it is absolutely reliable, positive results always indicating that the change in the vertical distance between the images is caused by the oblique muscles.

The atypical vertical divergence just

anomaly in most of the latter cases is congenital and in some of them distinguishable from the atypical vertical deviation due to a secondary contracture of the inferior oblique by an absence of the meridional disclination of the vertical meridians, and sometimes also of a vertical deviation in the primary direction of gaze.

If the paretic eye has better vision or has been dominant since childhood it is used for fixation and the patient presents a permanent secondary deviation of the sound eye. In the photograph (fig. 33A, B, C) the left eye is deviated downward. The deviation disappeared in dextroversion and increased to maximum in levo-version. At first glance one was led to think of a paresis of the left superior rectus, but the next photograph shows that in looking up and to the left both visual lines are elevated equally. That one was dealing with the secondary deviation of the right eye in a case of complete

paralysis of the left superior oblique, was proved by the position of the eyes in the lower part of the field of fixation; moreover, by the positive result of the head-tilting test. The habitual secondary devia-

tion of the nonparetic eye was due to hyperopic astigmatism of the latter. The vision was less than two-thirds of normal, while the paretic eye had full uncorrected vision.

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AMERICAN OPHTHALMOLOGY GROWS UP: TURBULENT YEARS FROM 1908-1915*

S. JUDD BEACH, M.D.
Portland, Maine

On January 30, 1938, a medical news story broke in the New York Sunday papers. It rated well over a column on the front page of the Education Section. Judging by the headlines, interest centered in its promise of a curb on the specialists in medicine. It predicted that, by 1940, before they started practice, the qualifications of these specialists would be tested by a national board.

The story was well told, and it properly censured the self-appointed specialist. It did not mention, however, the fact that the ophthalmologists had for years operated just such an examining board; that it was the genius of a few of their leaders that conceived this plan; and that only their careful experience and experiment had made possible the larger scheme, with 12 special boards and a coordinating advisory body. There was, indeed, no mention made of the ophthalmic board, although three of the younger boards were named. The truth of the matter is that in these few years the

perspective has become so blurred that the sharp outlines of events leading up to the movement for examining specialists have disappeared. Only to those of us who have had special interest in the work is the American Board of Ophthalmology more than just one of the many specialty boards—one of the last, in fact, to be recognized by the authorities. Yet it is believed by the men who were interested in this project that, besides being the pioneer in testing specialists, the ophthalmic board has also been the source of the present stir in graduate medical training. If this is a fair statement, it seems only reasonable to claim this new impressive examining structure as a monument to those of our specialty by whose ingenuity and foresight it was conceived 25 years ago. The object of these remarks is to place a modest wreath in their honor.

Records of the period are either lacking or disappointingly discreet. There are, of course, no minutes for the Board itself prior to its organization in 1915. Its circulars simply state that, in 1913, the three national ophthalmologic organizations appointed a joint committee. This committee, after holding various meet-

* Presented at the Seventy-fourth Annual Meeting of the American Ophthalmological Society at San Francisco, California, June 9-11, 1938.

ings, emerged with the project of a joint examining board. As a consequence, in 1915 there was organized what is now the American Board of Ophthalmology. The chronicles of the Board record nothing to suggest that the process was not so simple a one as has just been described. In reality, for a period of years, various groups had been wrestling with unprecedented problems in ophthalmologic sociology. It was by the momentum thus generated that this machinery was set in motion.

The law takes for granted, as medical men know, that any graduate in medicine is qualified, without additional study, to declare himself a specialist. Consequently, at the turn of the century, specialism, and more especially that dealing with diseases of the eye and ear, found itself infested by charlatans. After a severe winter had exhausted the general practitioners, the more prosperous communities would acquire a plague of "mushroom specialists," many of whom had hardly moistened their lips at the Pierian spring.

Those who were interested in this state of affairs during the first decade of 1900 will probably recall three needs: First, to provide facilities for proper graduate training; second, to arrange for testing the qualifications of specialists; and finally, and most difficult, to induce these practitioners to submit to such a test.

The Transactions of the American Ophthalmological Society and those of the Section and the Academy—to use the shorter names for the Section on Ophthalmology of the American Medical Association and for the American Academy of Ophthalmology and Oto-Laryngology—read as though by 1908 ophthalmology had suffered a little colic from its bolus of partly trained specialists.

The chairman's address at the meeting of the Section in 1907 rather exemplifies

the period then closing. It was a discourse of much elegance with the title, "The duality of man." Its unfettered scope is shown by the closing promise to "reveal what spirit is, provided some one would tell what is matter." The following year someone began to tell what was the matter. Fittingly, the speaker was William H. Wilder, of Chicago, for many years afterward the secretary and wise and kindly autocrat of the ophthalmic board. On June 2, 1908, at the First Presbyterian Church in Chicago, in his address as chairman of the Section, Wilder discussed the need for coöperation in the speciality, and that fall, at the meeting of the American Academy of Ophthalmology and Oto-Laryngology, four of the papers were in the same vein. Derrick Vail the elder, in his president's address, said: "It should no longer be possible to be called an oculist after a month or six weeks in a postgraduate school." Vail suggested that a year or two of internship in general medicine, followed by a sufficiently long term in an ophthalmologic institution in America or abroad, should be required, after which he proposed that the student should appear before the proper examining board, one similar to any state board of examination and registration, in order to obtain a license to practice ophthalmology. This plan for a state authority for registration in ophthalmology was suggested repeatedly thereafter. Why it was never adopted was due partly, perhaps, to the difficulty of getting the law enacted. Then, too, with various cults clamoring for recognition, it presented hazards that it may well have seemed wise to avoid.

Laertus Connor, of Detroit, made a startling plea for the teaching of "ophthalmology for students of general medicine." Connor reported that a poll of a county medical society in Michigan showed that the members had never

heard a lecture on refraction, nor been taught how to refract. Most of their eye cases went to opticians. To remedy this condition he advocated that "as much instruction in ophthalmology as possible be given to undergraduates without violence to other courses." They should be enabled to recognize and treat all eye injuries except those concerning intra-ocular foreign bodies; all eye infections; diseases of the uvea; also what he termed simple hyperopia, simple myopia, and simple presbyopia. This was an undisguised attempt to compete with refracting opticians, and will be discussed more fully further on.

Edward Jackson, of Denver, without criticizing Connor's plan, deprecated "teaching the medical student that the crude guessing he can do after the instruction given to large classes in our medical schools will do justice to patients suffering from eye strain." Jackson's suggestion was that when the last year of the medical course is devoted to electives, a sufficient time should be allotted to this kind of work.

Wendell Reber, of Philadelphia, was more outspoken. He said: "Until a man has looked at a thousand eyegrounds . . . his opinion is worse than useless: it is dangerous. Why burden him with half learning a technique that is a waste of time?" Replying to Casey Woods's paper, he said: The refinements of ocular pathology are absolutely postgraduate work."

The chairman's address at the 1909 meeting of the Section at Atlantic City can be regarded as a keynote speech. Alvin A. Hubbell, of Buffalo, though, perhaps, not so original as Wilder, whose remarks had inspired him, "had the knack of selecting the salient points out of even a complicated question and making it clear and easily comprehended by the average reader." Hence it is fortunate

that he chose to assemble and present the diverse topics that were being discussed. Evidently the importance of his inaugural address made a lasting impression, for his biographer for the American Ophthalmological Society made especial mention of it. This reference would be more complimentary if either the subject or the year were correctly stated. Hubbell advocated a required course in ophthalmology for undergraduates, checked by examinations before both the medical faculty and the state licensing board; and for specialists, thorough postgraduate study and clinical work, followed by examination for practice by expert ophthalmologists. He advised that committees be appointed to start proceedings.

This was a remarkably prompt answer to Wilder's call for coöperation, even making allowance for a receptive frame of mind due to threats of outside competition. Of the three activities that followed, two started bravely and failed. The third resulted in the organization of the American Board of Ophthalmology.

1. SIMPLE REFRACTING BY FAMILY PHYSICIANS

To understand the agitation for "simple refracting" requires a picture of its champion. Laertus Connor, of Detroit, previously mentioned, will probably be remembered chiefly for his ability as an organizer. Massive and robust, he was a dominating figure in all medical circles. Besides holding executive offices in most local and state medical organizations, he had served as chairman of the Section on Ophthalmology and as president of the American Medical Association. As founder of the Council on Chemistry and Pharmacy, and as a member of the committee that launched the Journal of the American Medical Association, his influence endures. Connor was a powerful

advocate for any plan he sponsored. He was appointed to the committee to consider the recommendations in Hubbell's chairman's address. With Connor on the committee, it was inevitable that it would recommend his plan for teaching ophthalmology to undergraduates and general practitioners.

By 1910 it emerged as the Committee on Family Physician Refracting. That Connor was appointed chairman was not surprising. The committee's report envisioned a refracting army of 130,000 doctors, thus, according to them, covering an estimated group of 180,000,000 human eyes. On analysis it is clear that the statistician responsible for these figures was in error. Nevertheless, the committee had accomplished no mean task. Thus, they had approached all the state boards; they claimed to have persuaded four, those of Nebraska, Michigan, Vermont, and Utah, to make a knowledge of refraction one of the requirements for a license to practice medicine; to have secured endorsement of the plan by periodicals, including the conservative *Boston Medical and Surgical Journal*, and by General Gorgas, the president of the American Medical Association. In Connor's own state of Michigan a license was being granted only to applicants who could "demonstrate upon living subjects with simple spherical lenses their working knowledge of refraction." Charles A. L. Reed, ex-president of the American Medical Association, called this the logical remedy for the optometric evil. The House of Delegates endorsed the appointment in every state of a committee to coöperate with the national committee on Family Physician Refracting. In many states, including Maine, this committee was actually appointed. During the following year Laertus Connor died, and the whole elaborate structure vanished. It did not simply fall to pieces for there were no pieces left, it sank without a ripple!

2. OPTOMETRY COMMITTEE

Mystery surrounds the 1908 report to the Section by Wilder and Lucien Howe, of Buffalo, who comprised the Committee on Legislation Concerning Opticians. There are no records of their recommendations except that they were referred back for revision. Instead of presenting this revision, the following year the committee requested to be discharged. The reason given was that the members had been made chairmen of other important committees and could not give the necessary time to this one. John C. Bossidy, of Boston, and James Thorington, of Philadelphia, were thereupon appointed, without evasion, as a Committee on Optometry. Their report to the 1910 meeting advocated "no recognition and no compromise" and was accepted. The committee also persuaded the Section and the House of Delegates, in which Bossidy represented the Section, to express their disapproval of ophthalmologists serving on boards with opticians in examinations for licenses in the mechanical examination of eyes. Similar action was also taken by the American Ophthalmological Society. Bossidy's committee was discharged at its own request in 1912, having compiled the *American Medical Association Bulletin on Optometry*. It is unnecessary to state that opposition to optometry assayed almost total loss. When the agitation ceased, the result was the recommendation to introduce a restraining clause into optometry bills. The report written by Wilder, as chairman of the Optometry Committee of 1913, recommending this was not fully concurred in by his associates, Edgar S. Thomson, of New York; E. C. Ellett, of Memphis; John Green, Jr., of Saint Louis; and Hiram Woods, of Baltimore; the latter the Section chairman. The clause prohibited the sale of lenses to persons with defective vision, squint, or diseased eyes without a physician's prescription, and

precluded the use of the title "doctor." It was a variant of the "Jackson" clause, used effectively in Colorado and Maryland.

3. GRADUATE EDUCATION

Jackson had been adroitly swinging the feeling against the optometrists behind his struggle for improving ophthalmologic training. In 1911 he read a paper at Los Angeles on "The optometry question and the larger issue behind it." He first punctured the slogans used so devastatingly by the optometrists in their struggle for recognition. One still remembered is, "A lens is not a pill." "No more," declared Jackson, "is a hypo syringe a pill, or a thermometer, or a knife." He then proceeded to upbraid the ophthalmologists for the predicament they had gotten themselves into. This was the larger issue. "The most important thing that the medical profession has to do is to provide adequate teaching for ophthalmology. Failure properly to perform this duty to the public," he charged, "is responsible for the optometry question."

The first effect on the meeting was to arouse indignation against optometrists, and especially against those general practitioners who, by sending patients to the optometrists, were responsible for the disastrous neglect of emergencies like glaucoma and brain tumors. Finally, F. Park Lewis, of Buffalo, brought the discussion back to the subject of education by saying that "we are never going to get rid of optometry by simply opposing it."

Year by year Jackson's efforts increased in effectiveness. His paper of 1911, just mentioned, had persuaded the Section and the House of Delegates to pass a resolution that, as ophthalmology requires certain subjects not demanded for the degree of M.D., all medical schools possessing the facilities should

establish graduate courses of one year in ophthalmic institutions. In 1912 Jackson addressed an evening session of the Section in Atlantic City, taking as his subject the curriculum leading to the degree of Doctor of Ophthalmology, describing the experiments at Oxford and Liverpool, and his own course at the University of Colorado. This address impelled Samuel D. Risley, of Philadelphia, to deride the postgraduate students "who came for six weeks to a polyclinic to learn refraction and spent their time wandering from clinic to clinic to watch operations; in Europe they got even less out of it because the language was imperfectly understood. Finally there was no way of rating their proficiency." The truth of these charges has been borne out remarkably by the subsequent experience of the American Board of Ophthalmology. These men, who have taken disconnected short courses here and there, have been found to make the poorest showing, and those who have pursued this type of training abroad attain the lowest grades.

There was still no answer to the problem of inducing students to undertake these courses. Why would the average specialist, whose state license permitted him to practice, devote two years to this needless pursuit? And then why should he struggle with a perfectly gratuitous examination?

4. THE JOINT BOARD

The establishment of a state examining board seemed still to be desirable, but no one cared to undertake its organization. The first feeble gesture toward the unique project of an unofficial joint board issuing a certificate to be required for society membership was apparent at the 1913 meeting of the American Ophthalmological Society when John E. Weeks of New York moved to refer to a committee the stiffening of the require-

ments for membership. This action had been urged on behalf of the membership committee by the chairman, George E. de Schweinitz, of Philadelphia. The newly appointed committee was instructed to formulate standards for the proposed Doctorate of Ophthalmology. In his presidential address, Myles Standish, of Boston, had declared that it would be a very diverse degree with the variety of colleges authorized to grant it. It is ironical that he should have been the one to inaugurate a new venture. He was small, competent, as irascible as his Puritan antecedent, but as stand-pat as Plymouth Rock.

It is in the report of this "Committee on Diploma in Ophthalmology" that the primary interest of this article centers—not in what it says, but in what it omits to say. De Schweinitz was chairman of the committee, and the other members were Standish, Risley, Jackson, and Weeks. These men outlined the curriculum that should lead to the proposed degree, and explained the reason for making it Master in Ophthalmology in preference to several other obvious titles. They provided also for a thesis and an examination, but evidently both were to be ranked by the university authorities. The significant thing was the absence of the slightest intimation of a joint examining board. The one step in that direction that can be detected after a painstaking review of the records is a suggestion by de Schweinitz that his committee be combined with that from the Section and from the Academy. This was solely with the purpose in mind of bringing more pressure to bear upon the medical schools for the establishment of graduate courses.

By inference, the project of the joint board must have been conceived during the month elapsing between the meeting of the American Ophthalmological Society at Hot Springs in May, 1914, and

that of the Section in June. As was just stated, Jackson, chairman of the Section committee, was also a member of the American Ophthalmological Society committee, and had signed their report, and four other members of the Section committee, Woods, Wilder, Zentmayer, and Duane, were present at the Hot Springs meeting in May, 1914, and took part in the discussion concerning it. Zentmayer, in particular, was scrupulous to avoid ambiguity in the wording. It seems incredible that they were considering so radical an enterprise.

The report was presented to the Section in June. Jackson observed that the experience of the Royal College of Surgeons of England and that of the Royal College of Physicians of London pointed the way to a practical method of certifying. The members of their conjoint examining board were drawn from 21 schools. Although the board conferred no degree or right to practice, rejected 40 percent of the candidates, and demanded fees of \$210, nevertheless a large proportion of the men entering practice took the examination. Jackson recommended the formation of a board in this country on a similar basis. To complete the arrangements, he advised inviting the coöperation of committees from the American Ophthalmological Society and the Section on Ophthalmology.

It will be observed that there is still no intimation of the provision that the certificate of the Board would be required for membership in the American Ophthalmological Society and the Academy, and for officers and positions on the program of the Section. This seems not to have been proposed until the proceedings of the joint committee were reported in 1915. In that year the American Ophthalmological Society did not meet until July, at New London, Connecticut. This document, which was formulated by the chair-

men of the three committees, was therefore first submitted to the meeting of the Section at San Francisco, under the chairmanship of E. C. Ellett, of Memphis.

One object of this study was to determine how much the formation of the Board was assisted by the optometrist agitation. The opinion of those active at the time is well worded in a letter from John E. Weeks, in which he says: "In regard to the influence of optometrists in bringing about the formation of the American Board for Ophthalmic Examinations, their statement that many ophthalmologists did poor work in refraction could not be denied. Their contention had much to do with causing Connor to propose 'simple refraction for family physicians,' but it was only one of the stimuli that were instrumental in the creation of the examining board, and not an important one."

This ingenious means for persuading oculists to prepare for and take examinations by requiring the certificate of an independent board for society membership is credited to Edward Jackson. This was the culmination of his prolonged relentless warfare on incompetence in the profession, begun at least 30 years previously.

For later consideration are the organization of the Board and its development. That the devoted group associated with Jackson began conducting examinations in 1915 is now history. Up to 1938, in spite of the early complaints by those who resented what they pleased to miscall a "self-appointed tribunal," 55 examinations had been held and 1,440 candidates had been certificated in all parts of the United States and in Canada. In conducting these examinations many of the most distinguished ophthalmologists have been associated with the Board, and leading hospitals have generously provided facilities for them. The certificate has been made a requisite for membership in many sectional and local societies and on hospital staffs. This has had the intended effect of compelling universities and hospitals to formulate courses in preparation for the examination. A characteristic example of the improvement in education has been the introduction, into residencies, of systematized courses of instruction. The most far-reaching and spectacular result of this enterprise, however, has been the adoption of the board method of examination by 11 other specialties and their coordination in the advisory board for medical specialties.

DISCUSSION

DR. GEORGE F. LIBBY, San Diego, California: At Dr. Beach's request, I am glad, after listening to his interesting paper, to speak briefly of the bearing of Colorado on the movement which he has so well described. In 1912, under the auspices of the University of Colorado and with Dr. Edward Jackson's direction, we established in Denver a postgraduate school for advanced teaching in ophthalmology. There were 11 students—one from Pennsylvania, two from the Middle

West, and eight from Denver. Dr. Crisp and I were both students and lecturers in that course, which was of six weeks' duration. Local men and some leading ophthalmologists from other parts of the country lectured and held clinics. In the following year, after a year's reading in ophthalmology under Dr. Jackson's direction, three of us, having passed the examinations, received the degree of Doctor of Ophthalmology at the state university. I am speaking of this because

I believe that the Colorado movement leading to the certification of men who had taken advanced standing in ophthalmology, and also the courses given at that time in the University of Pennsylvania and in the University of Minnesota, leading to the degree of Doctor of Science in Ophthalmology, had a very important bearing on the development of the American Board of Ophthalmology. As I understand the matter, it seemed far better to the men who started the movement to have a national board of examination certify to the attainment of high standing in ophthalmology, rather than to serve that purpose by a doctorate degree; and I think that was the wiser way. I simply wish to express my appreciation of what Dr. Jackson did in Colorado and in our country in helping toward the establishment of this movement. I am thankful that I had a small part in starting the work. As I was at that time 44 years of age, I was told by the younger ophthalmologists that when I stepped up as the first registrant for the course they felt ashamed not to follow. At this time it seems appropriate for me to touch upon what was done in Colorado, and by our Dr. Jackson, to help this movement along.

DR. W. B. LANCASTER, Boston: The Society is grateful to Dr. Beach for this important historical contribution. Perhaps you think it is a simple matter to write such a paper: that all you have to do is to look up the records in the Transactions and find out what was done year

by year! There is a great deal more to it than that. The historian must evaluate what he finds and interpret it for us, and, besides, the records are very meager. They simply say, "it was moved and carried, etc." Take the epoch-making meeting of last night; when the future historian tries to find out the facts, he will simply be confronted with the record, "moved and voted." Nothing will be said of how Horatio held the bridge, who fought on his right hand, and who on his left hand, and what soldiers stood behind him, and how they met the onslaughts of the reactionaries and the die-hards!

Perhaps you think that when the American Board of Ophthalmology was formed matters were all peaceful, but I assure you that was not the case. When the Board first made its appearance many a finger of scorn and ridicule was pointed at it by men in high position. But we were fortunate, in those days, in having for leaders men of vision and of courage, especially of vision, who could see the future while we were still in a fog, and did not see the shining heights above; men who led us on to great achievement, so that now we are proud to have the stone which was rejected by many made the headstone of the corner: Ophthalmology leading all the specialties, from otolaryngology to surgery.

DR. WILLIAM H. CRISP, Denver: In the future we shall say: "There were giants in those days."

CONTRIBUTION TO THE THEORY AND PRACTICE OF TONOMETRY*

II. AN ANALYSIS OF THE WORK OF PROFESSOR S. KALFA WITH THE APPLANATION TONOMETER

JONAS S. FRIEDENWALD, M.D.
Baltimore

In the previous paper¹ a theoretical analysis was undertaken to distinguish the influence of ocular rigidity from that of intraocular pressure on tonometric measurement with the Schiötz tonometer. A method was devised whereby these two components of the tonometric reading could be separately evaluated and their independent variations studied. It is

field; second, to an attempt to relate that work to the study of the Schiötz tonometer.

In his investigations, Professor Kalfa has used the Maklakow tonometer, an instrument of fixed weight with a small plane surface as its base (fig. 1). Measurements are made with this instrument as follows: After 1-percent holocaine anesthesia, a drop of concentrated solu-

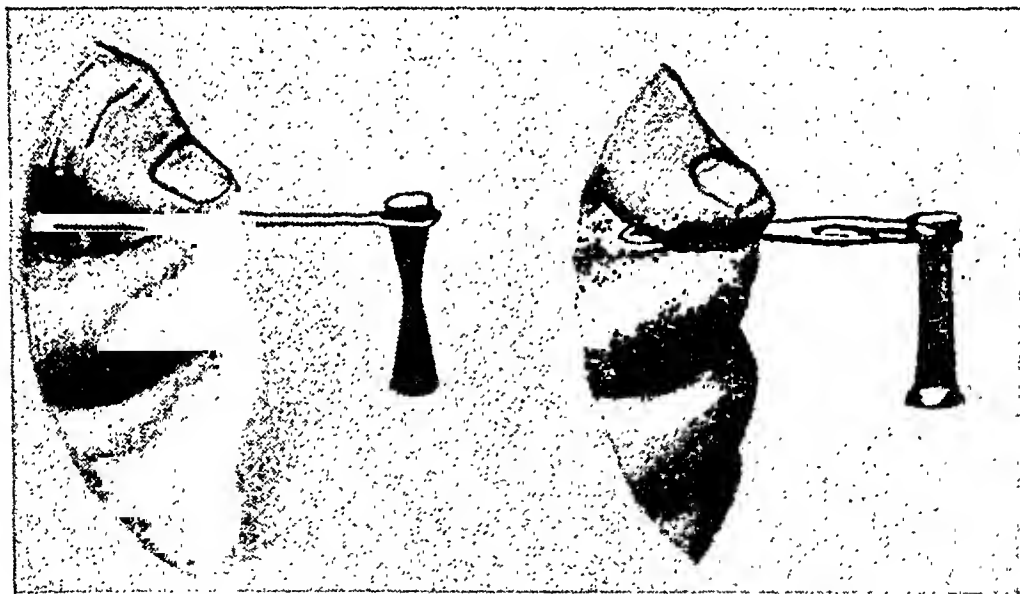


Fig. 1 (Friedenwald). Maklakow tonometer (after Lloyd).

much to be regretted that at the time of publication of this study, the writer was unaware of the important contributions which Professor S. Kalfa of Odessa had already made to this subject.^{2, 3, 4, 5, 6, 7} Since much of Kalfa's work may be unfamiliar to the American reader, the present article will be devoted, first, to a review of Kalfa's work in this

tion of bismark brown in water and glycerine is allowed to spread over the cornea. The flat base of the tonometer is now allowed to rest on the cornea for a moment and then a print is made of the area of corneal contact by pressing the tonometer on a piece of paper. The diameter of the print or "tonogram" is measured with calipers. Duplicate measurements are said to agree to 0.1 or 0.2 mm.**

* From the Wilmer Ophthalmological Institute of the Johns Hopkins University and Hospital.

** Applanation tonometry has not been widely used in this country and is generally re-

Kalfa first proved that the act of tonometry with the Maklakow tonometer raises the intraocular pressure. This was accomplished through direct measurements on enucleated eyes of animals and of human beings. The eyes were connected with a manometer through a canula placed in the optic nerve. The intraocular pressure could be brought to any desired level, and the connection to the manometer could be left open or closed. When the tonometer was allowed to rest on the cornea it was regularly found that the intraocular pressure was higher; that is, the area of appplanation was smaller when the connection between the eye and the manometer was closed than when it was open. As further evidence, the author was able to show that if, after tonometry, the Maklakow tonometer is allowed to rest on a normal eye for two minutes, at the end of which time a fresh tonometric measurement is made, one finds the pressure regularly lower on the second tonometry than on the first. This shows that the tonometer, while resting on the eye, raised the intraocular pressure and expressed some intraocular fluid. Finally, Kalfa made use of Maklakow tonometers of different weights and showed that the tonometric measurement regularly yielded a higher reading when a heavier tonometer was used.

From these observations Kalfa concludes that the intraocular pressure is raised by the act of tonometry, and that the true intraocular pressure is somewhat less than that indicated in the tables published by Golowin.* How much the act of tonometry changes the intraocular pres-

garded as less accurate than indentation tonometry. The relative merits of the two procedures are, however, irrelevant to the present discussion.

* Tables based on the law of Fick and Maklakow, see below.

sure depends among other things on the elasticity of the eyeball. Since tonometers of different weights produce different changes in intraocular pressure, a comparison of readings made with tonometers of different weights on the same eye can yield information concerning the elasticity of the eyeball. Filatow had previously prepared a set of Maklakow tonometers weighing respectively 5.5, 7.5, 10, and 15 grams, and these were placed at the disposal of Kalfa. In using this set of tonometers, the latter measured first with the lightest instrument and then with successively heavier instruments. On normal eyes the successive measurements invariably yielded successively higher pressure readings when the pressure was determined with the Golowin tables. The results for a single case or the average results for a group of cases may be charted as shown in figure 2, the pressure as ordinate, the tonometer weight as abscissa. The author denotes such a graph as an "Elastometric curve." Such curves obtained on normal people usually approximated straight lines. The slope of the curve, or more specifically the rise in pressure from the 5.5 to the 15 gram reading was used as a measure of rigidity. This may be designated "Elastometric Rise" or E. R. Evidently of two eyes with the same intraocular pressure the one with the greatest E. R. is the more rigid.

In 100 normal eyes the average E. R. was 9.9 mm. Hg, with 7.1 and 12.1 as the lower and upper limits. The E. R. increases with age, the greatest changes being before the age of 20. In progressive myopia the E. R. is noticeably less. In untreated glaucoma the E. R. is greater than normal and the elastometric curves are often irregular with steps or peaks, heavier weights sometimes yielding lower pressures than previously used lighter weights. Most irregular curves are ob-

tained in treated glaucoma. Kalfa has devoted special attention to the irregularities in the elastometric curves in glaucoma, and has used these to study the vasomotor reflex regulation of intraocular pressure, a subject of great interest which does not, however, concern us here.

The simplicity of the approach to this problem that Kalfa has achieved with the applanation tonometer stands in

in elasticity introduce errors in pressure readings in ordinary tonometry, so variations in pressure introduce errors in rigidity readings, for the tonometric reading that is the basis for determination of either pressure or rigidity is actually determined jointly by these two features.

In order to separate rigorously the pressure and rigidity factors in the tonometric measurement, an analysis similar

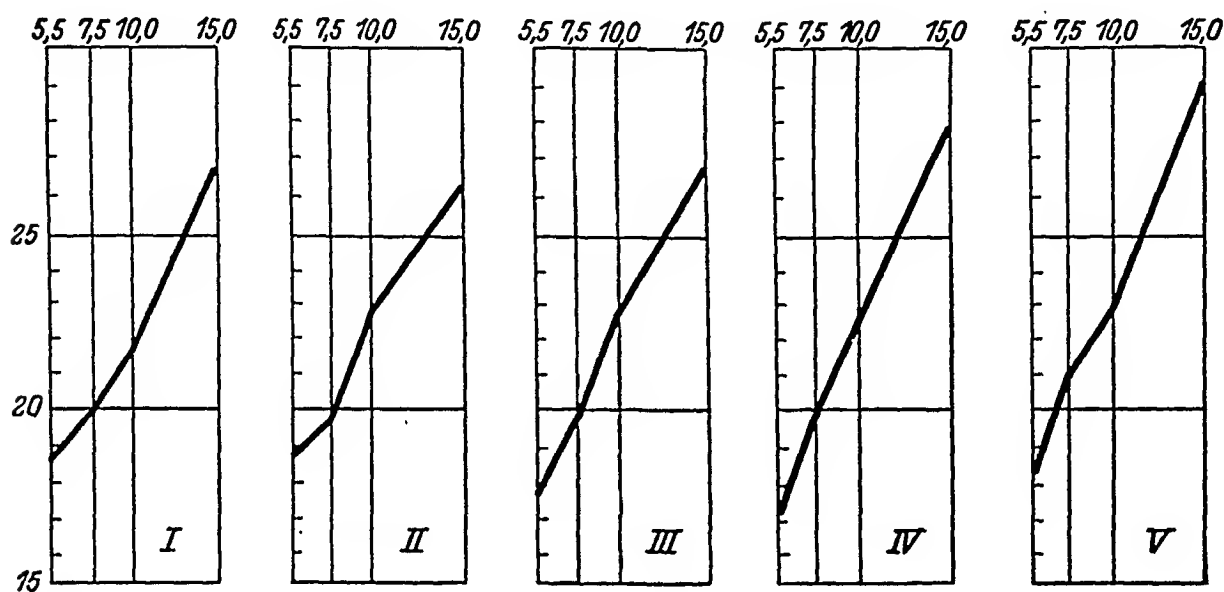


Fig. 2 (Friedenwald). Elastometric curves of Kalfa (see Ref. 5, p. 277). I, 7-year-old boy; II, average of 14 patients aged 10-14 years; III, average of 10 patients aged 15-19 years; IV, average of 9 patients aged 20-25 years; V, average of 10 patients aged 30-55 years.

marked contrast with the complex treatment that a similar analysis of the measurements with the Schiötz tonometer required. The validity of both methods is supported by the widespread agreement in clinical observations achieved independently. Without by any means disparaging the simplicity of Kalfa's solution, it may be pointed out that this simplicity has been reached through the neglect of one feature in the elastic reactions of the eyeball. It is evident that if the pressure in two eyes is equal, the eye that has the steeper elastometric curve is the more rigid, but the analysis of Kalfa provides no means of comparison between eyes with unequal pressures. Just as variations

to that which was undertaken previously in relation to the Schiötz tonometer is required. When the tonometer rests on the cornea it deforms the cornea and displaces fluid equal to the volume of the deformation. This displaced fluid is accommodated within the ocular cavity by a stretching of the ocular coats and by a displacement of some blood from the intraocular vessels. Depending on the resistance that is offered to this displacement, a greater or smaller rise in intraocular pressure will occur. In the previous paper it was shown that for any given eye the same volume displacement always produced the same percentage of change in pressure. Stated mathematically:

Log $P_2 - \text{Log } P_1 = K(V_2 - V_1) \dots (1)$
Where K is a constant characteristic of the eye measured, hence K may be taken as a measure of ocular rigidity.

designated the coefficient of rigidity. It is independent of the particular range of pressure over which the determination is made.

In order to determine K we must know the values of P and of V ; that is, the ac-

Owing to the complex form of the corneal indentation produced by the

TABLE 1

RELATION OF DISPLACED VOLUME AND INTRAOCULAR PRESSURE CORRESPONDING TO DIFFERENT DIAMETERS OF APPLANATION AS MEASURED WITH THE MAKHLAKOW TONOMETER

Diameter of Applanation mm.	Volume Displaced mm. ³	Pressure in mm. Hg with Various Tonometer Weights			
		5.5	7.5	10	15
2.0	0.1	128	175	230	350
2.5	0.2	64	88	115	175
3.0	0.5	57.7	78	105	157
3.5	1.0	42.3	57.5	77	115
4.0	1.6	32.4	44.2	59	88
4.5	2.7	25.8	35.2	47	70
5.0	4.1	20.9	28.5	38	57
5.5	6.0	17.1	23.3	31.0	46.5
6.0	8.0	14.4	19.6	26.2	39.3
6.5	11.7	12.3	16.7	22.3	33.5
7.0	16.1	10.6	14.4	19.2	28.8
7.5	21.0	9.2	12.6	16.8	25.2
8.0	28.0	8.1	11.0	14.7	22.0
8.5	38.0	7.2	9.8	13.1	19.6

tual intraocular pressure and the volume of the corneal indentation corresponding to tonometric measurements with different weights. When these paired values of P and V are known, they can be charted on a scale that is linear with respect to volume and logarithmic with respect to pressure. Such points fall on straight lines and the slope of the line drawn through them is a measure of K . The value of K , so determined, has been

Schiötz tonometer, considerable complexity was encountered in determining what volume of indentation corresponds to given tonometer readings. In respect to the applanation tonometer, no such complexity exists, for the volume of the displaced fluid may be assumed to correspond to that of a segment of a sphere having the tonogram for base and the undistorted cornea for dome.* Table 1 gives the volume calculated to correspond

* These simple assumptions yield volume estimates that are only approximately correct. Variations in corneal curvature and the presence or absence of corneal astigmatism introduce errors that could be allowed for only by very laborious calculations. Kalfa has pointed out that during applanation the corneal lamellae probably slide over one another so that the area of the tonogram may be larger than the area of the base of the flattened area on the inner surface of the cornea. Furthermore, capillary attraction may cause some enlargement of the tonogram, and any rocking or slipping of the tonometer or the cornea would have a similar effect. There appears to be no direct method of allowing for these errors. On the whole they should lead to an underestimate of intraocular pressure and an overestimate of displaced volume.

The formula for calculating the volume of a segment of a sphere is: $V = \pi a^2(r - \frac{a}{3})$ in which r is the radius of curvature of the sphere (in this case 7.8 mm., the average radius of curvature of the cornea), and a is the altitude of the segment. The latter is given by the formula: $a = r - \sqrt{r^2 - R^2}$ in which R is the radius of the base of the segment of the sphere; that is, the radius of the tonogram.

to different diameters of the tonogram, and also the intraocular pressure calculated by the formula of Fick and Maklakow.**

The data of table 1 may now be combined graphically in the chart shown in figure 3, which is analogous to the nomo-

displaced fluid, corresponding to a given tonometric reading. If readings are made with the four different tonometers and are plotted on this chart, they should, if our theory is correct, fall approximately on a straight line. The slope of such a line is the coefficient of rigidity of the eye

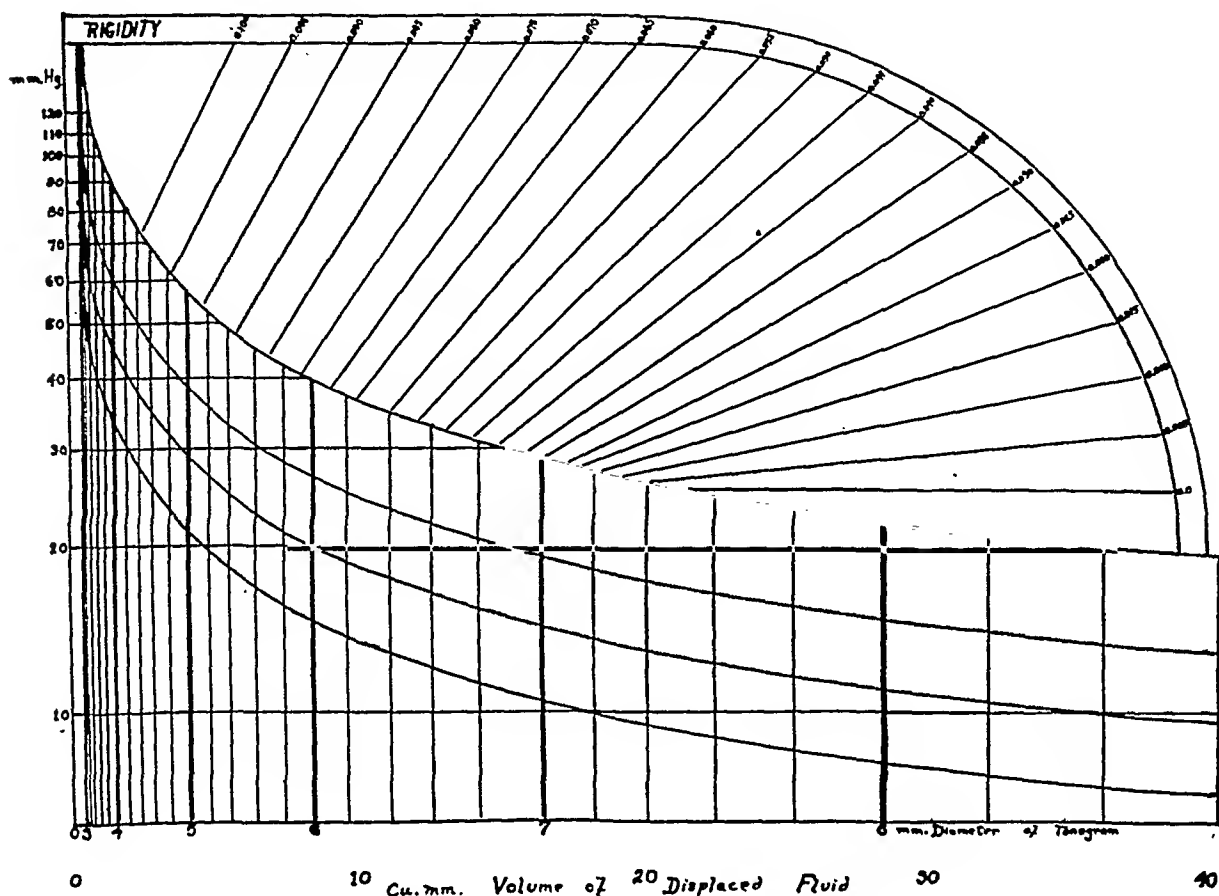


Fig. 3 (Friedenwald). Chart for the determination of ocular rigidity from tonometric readings with the applanation tonometer.

gram for determination of ocular rigidity and pressure with the Schiötz tonometer published in the previous paper. The four curves correspond to applanation tonometers weighing respectively 5.5, 7.5, 10, and 15 grams. The ordinates of points on these curves are proportional to the logarithm of the pressure, the abscissas are proportional to the volume of the

measured. A set of sloping lines for graphic comparison, and the numerical values of their slopes, is included in the upper portion of the chart.

In figure 4 are charted the data of Kalfa that are given in the first and last elastometric curves of figure 2 above. The slopes of these curves are respectively 0.011 and 0.021. The five elasto-

** This formula is based on the necessary equality of the upward force of intraocular pressure operating over the area of applanation and the downward force of the weight of the tonometer: $W = P \times A$. The pressure in grams per square millimeter is readily transformed into millimeters of mercury as given in the table. This portion of the table is identical with that of Golowin referred to above.

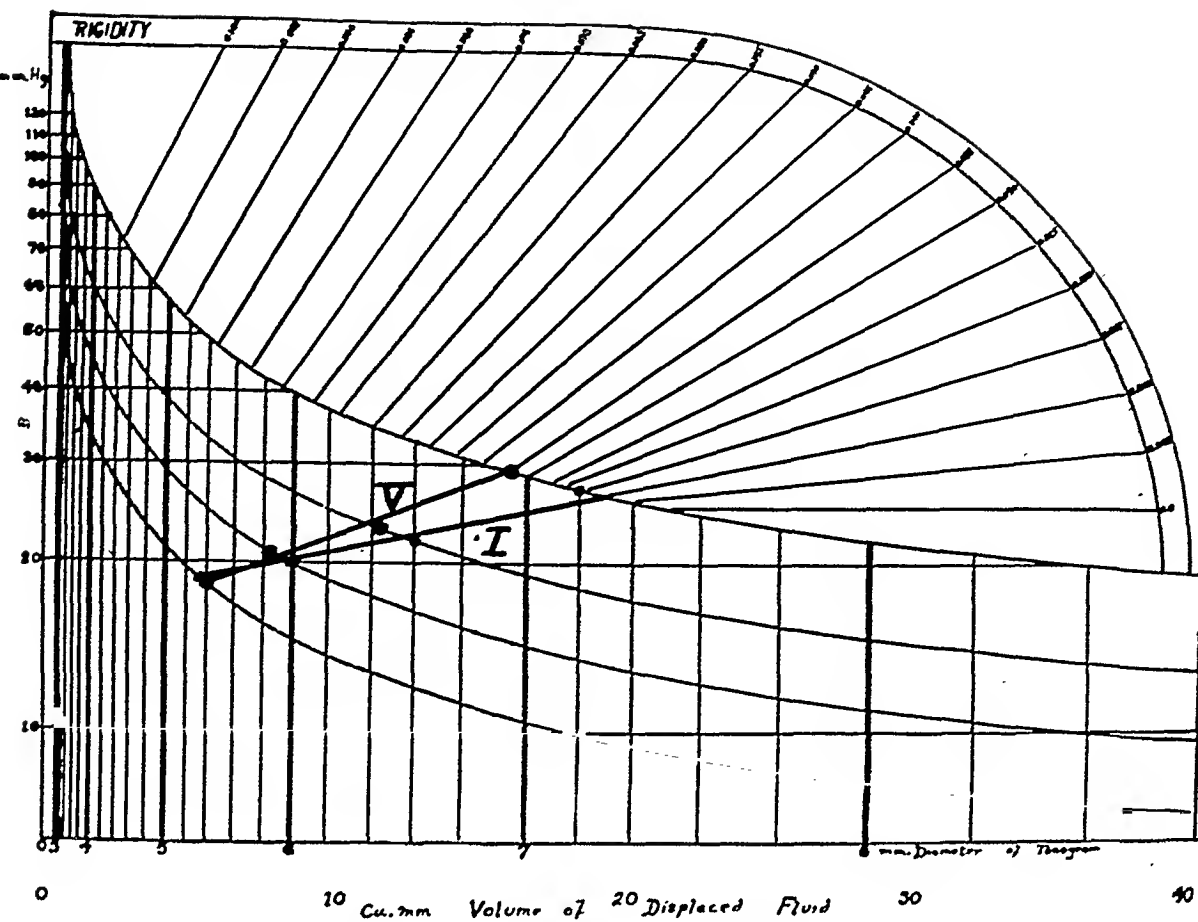


Fig. 4 (Friedenwald). Kalfa's data, from figure 2, charted for determinations of ocular rigidity.

metric curves of figure 2 were presented by Kalfa to show the variation of these curves for different age groups of normal persons. In table 2 the values of rigidity coefficients computed from these five curves are given, and compared with the average rigidity coefficients of corresponding groups as determined with the Schiötz tonometer, and reported previously. Considering the number of simpli-

fying assumptions that were introduced into both calculations the agreement between these two independent sets of measurements is remarkable.

It is evident from the above that the chart given in figure 3 may be used with Kalfa's elastometric diagram as a pair of mutually complementary dictionaries for the translation of values of rigidity coefficient into corresponding values of

TABLE 2
RELATION OF RIGIDITY TO AGE

Kalfa			Friedenwald		
Age	Number of Cases	Coefficient of Rigidity	Age	Number of Cases	Coefficient of Rigidity
7	1	.011			
10-14	14	.011			
15-19	10	.018	15-30	135	.021
20-25	9	.019	30-50	182	.021
30-55	10	.021	50-60	102	.022
			Over 60	81	.029

elastometric rise. This translation is reduced to a single chart in figure 5 in which it is seen that small values of elastometric rise (E. R.) correspond to fairly stable values of rigidity coefficient, irrespective of the pressure level at which the measurement was recorded, but that larger values of E. R. correspond to values of rigidity

ing for the intraocular pressure independent of the ocular rigidity. A similar and much simpler computation may be made for the applanation tonometer as follows: Let us suppose that tonometric measurements have been made on a given eye with the four different Maklakow tonometers and that the results of these

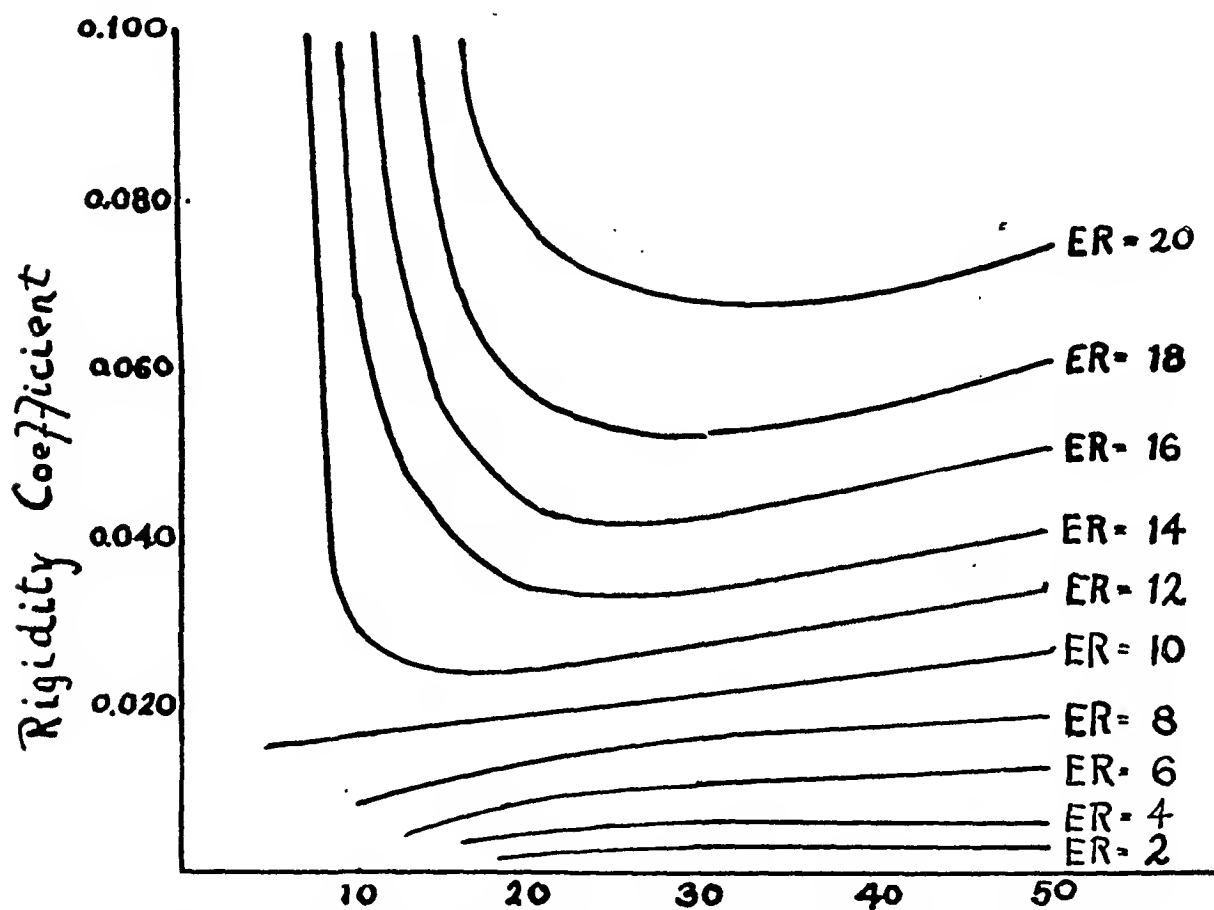


Fig. 5 (Friedenwald). Relation of elastometric rise of Kalfa (E. R.) to rigidity coefficient of Friedenwald is shown to vary with intraocular pressure.

which vary markedly with pressure. The pressure indicated is that determined with the lightest tonometer (5.5 gm.). Applying this chart to the data given by Kalfa for the maximum range of variation of E. R. (from 1.8 to 27.9) the corresponding range of variation of rigidity coefficient is from 0.002 to 0.100, figures which again correspond to the findings with the Schiötz tonometer.

In respect to the Schiötz tonometer, a method was worked out to obtain a read-

measurements have been charted as four points on the nomogram (fig. 6). A straight line is drawn as nearly as possible through these four points. The slope of this line, as before, is a measure of the ocular rigidity. If we imagine ourselves passing down this line from upper right to lower left, we should be passing through a series of points corresponding to measurements with lighter and lighter tonometers. The point (P) where the line crosses the vertical axis corresponds

to the measurement with a tonometer of infinitesimally small weight and hence, to the true intraocular pressure undisturbed by the act of tonometry.

Applying this method of computation to Kalfa's data for normal eyes, we reach an estimate for the average normal intra-

ocular pressure of 15 mm. Hg. This figure is in marked disagreement with the results obtained with the Schiötz tonometer from which the average normal intraocular pressure was computed to be 25 mm. Hg. This discrepancy is far too large to be accidental. As indicated above, a discrepancy of this sort was to be expected owing to the fact that the diameter of the tonogram is enlarged by a variety of factors. A simple calculation shows that if the radius of the tonogram as measured were regularly reduced by 0.5

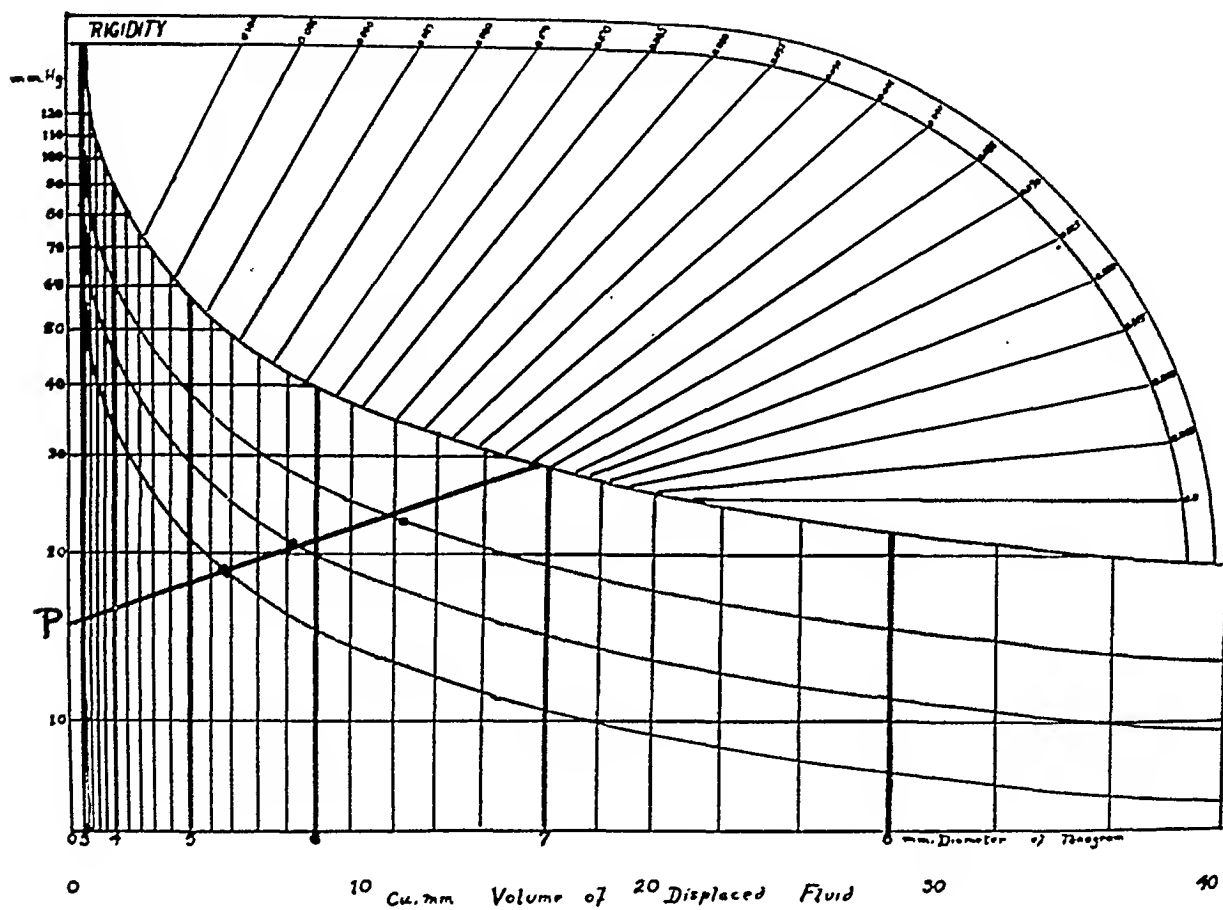


Fig. 6 (Friedenwald). Method of using the rigidity chart to determine intraocular pressure from readings with the applanation tonometer.

ocular pressure of 15 mm. Hg. This figure is in marked disagreement with the results obtained with the Schiötz tonometer from which the average normal intraocular pressure was computed to be 25 mm. Hg. This discrepancy is far too large to be accidental. As indicated above, a discrepancy of this sort was to be expected owing to the fact that the diameter of the tonogram is enlarged by a variety of factors. A simple calculation shows that if the radius of the tonogram as measured were regularly reduced by 0.5

the two instruments in the measurement of rigidity.

In summary, it has been possible to apply to Kalfa's elastometric measurements with the applanation tonometer the same type of analysis that the writer has in a previous publication applied to data obtained with the Schiötz tonometer. The agreement of the results furnishes a most satisfactory check on the correctness of this analysis. The elastometric rise that Kalfa has chosen as a measure of ocular rigidity is shown to

be closely connected with the coefficient of ocular rigidity as designated by the writer. The relation between the two is not linear but, in general, these two measures tend to increase or decrease together. The greatest discrepancies between these two measures is to be found in cases of low intraocular pressure and high ocular rigidity. In this group of cases the rigidity measure of Kalfa gives relatively smaller measurements than that of the writer. It is perhaps on this ac-

count that Kalfa failed to note that the ocular rigidity of persons with high myopia was greater than that of persons with low myopia, and also that there is a group of hyperrigid cases among otherwise normal old persons.

The number of cases that fall into this region of lesser agreement is, however, quite small. The results obtained by the two methods are thus capable of confirming and supporting each other.

1212 *Eutaw Place.*

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SUBJECTIVE STUDY OF VISUAL ABERRATIONS*

EDWARD JACKSON, M.D.

Denver

In the foreword to a recent edition of Sir Isaac Newton's "Optics," Einstein wrote: "Fortunate Newton, happy childhood of science! He who has time and tranquillity can, by reading this book, live again the wonderful events which the great Newton experienced in his young days." But the "childhood of science" has not passed; perhaps it is only beginning; and we, by experiment, may also read the open book of nature. Newton's "Optics" explained the rainbow, and laid a broad foundation for others to build upon. But the work of Oersted, Faraday, Kelvin, Clerk-Maxwell, and recent astronomers has pushed aside Newton's theory of gravitation, making place for the "relativity" theory of Einstein. Some of the oldest impressions and observations of vision still remain to be understood and explained.

The earliest representations of the stars and sun closely resemble the representations of them made today. Yet there has been no clear understanding of them. Helmholtz gave a representation of the appearance of "monochromatic aberrations" of his own eyes, but offered no explanation of their significance. Why do we see a star as a point of light?—not a mathematical point, but a bright object, extending irregularly in different directions. A telescope reveals a fixed star as a mathematical point, and a planet as a small round disc, without any irregular extensions. These are the true images formed by a perfect lens or perfect lens systems. What we see are the images formed by imperfect human eyes; and the

irregular projections are the effects of the monochromatic aberrations of imperfect eyes, no two of them exactly alike.

These star images may easily be studied by simple experiments, with very simple apparatus. When looking at a star in the evening, close first one eye and then the other: it will be noted that the images in the two eyes differ. The principal projections of light for one differ from those of the other. They extend in different directions, and branch differently. The use of lenses before the eye changes these projections and they vary with the size of the pupil. They exist through optical defects of the eye, and any change in the refractive conditions alters them.

We see the stars through relatively dilated pupils. It is easy, by covering some part of the pupil, to observe just what part of the image is formed by light passing through that part of the pupil. Looking at night at a star, or at a distant street light, the edge of a card may be brought before the pupil. As the edge of the card begins to cover a part of the pupil, a part of the image of the light disappears. The image that remains is formed by the part of the pupil still uncovered. If covering the bottom of the pupil removes the bottom of the image, the part covered is myopic. If covering the bottom of the pupil obliterates the upper part of the image, the aberration of that part of the pupil is hyperopic. If a corner of the card is thrust before the pupil, the part of the image lost will belong to that quadrant of it. In this way each part of the image can be connected with the part of the pupil causing it. When looking at a star through a circular opening, the periphery of the pupil

* Presented at the Seventy-fourth Annual Meeting of the American Ophthalmological Society at San Francisco, California, June 9, 1938.

will be excluded, making the opening smaller. When the opening is small enough, the aberration of the periphery of the pupil is excluded; and a star may become a point of light, as it appears when observed through a telescope.

Multiple crescent moons are caused by aberrations of the eyes. With a card to cover first one part of the pupil and then another, we can connect each image with the part of the pupil causing it. When a patient complains that he "sees too many moons," a demonstration of how such images are caused may relieve his anxiety, and create a confidence that the physician understands his case and can help him. By such subjective study of his own eyes, the ophthalmologist may watch the progress of changes in them, especially refractive changes.

It is possible to study your own refraction by autoskiagraphy,* using one eye to examine the refraction of the other. But the use of the subjective method, by means of a bright star, a distant street lamp, or an automobile headlight as the source of light, is generally more available and more convenient. This method can be taught to patients who are curious or morbid with reference to their own visual defects.

Representations of the sun, a disc of light (too intense to be looked at) with a region of brilliant illumination about it, and rays emanating from it in all directions, are composite images, based on general experience, going back to the early development of the race, that can be confirmed by the experience of each of us. So far as appears, there has been no careful study made of the physical basis of the impressions so expressed. No intelligent study of this phenomenon was possible until, within the last century, we learned the minute anatomy of

the eye and the mechanism of visual perceptions. Our subjective studies may further our understanding of visual optics, and may throw some light on the essential basis of vision.

What is now understood of the radiations from the sun and the luminous projections of its corona, as photographed at times of total eclipse, might lead us to explain the radiations we have seen as a general physical phenomenon, apart from vision. But experiment indicates that it occurs not in the sun or our atmosphere, but only in our eyes—a phenomenon especially suited for individual subjective study.

This appearance may be observed by the old experiment of looking at the reflection of the sun in a globule of mercury with a background of black velvet. This gives us a point of bright light at the center, with a background so dark that the single rays may be seen diverging in all directions. Such an image can also be seen at night by looking at a bright electric light far enough away to appear as a point. It is now most frequently seen in the reflections of the sun from the curved, polished surfaces of an automobile. It may best be studied by looking at the sun, or its reflection, through a very small opening in a metal plate, keeping the retina dark-adapted by the exclusion of other light.

When studied through a small opening, which may be shifted in front of different parts of the pupil, it is found that the divergent rays are reflections from the substance of the crystalline lens, very near to its anterior pole. The only structures that can give such reflections from that part of the eye are the surfaces of the lens fibers converging to their anterior attachments. The minute anatomy of these converging fibers has not been studied with reference to this particular optical effect; but for the glass membrane

* Jackson, E. *Ophth. Rev.*, 1897, v. 16, p. 227.

that covers them, or the particular lens Y to which they are attached, to cause such radiating lines is most improbable. The number of these fibers and the arrangement of their broader sides fit them to such reflections of the light falling upon them.

It must be remembered that in an eye with clear media, the rays we see are not like pencils of light passing through a smoke chamber. They are produced only by the light that has fallen on the sensitive layers, the percipient elements, of the retina. Light is invisible in the transparent media of the eye, just as it is when passing through the transparent atmosphere. The red rays of sunset are not visible in clear air. They are manifest only as they fall on clouds, smoke, or other visible objects. The radiating lines seen in the eye are the impress of light falling on radiating lines of retinal percipient elements. They are visible only through parts of the retina that are situated so as to receive them, and sensitive enough to be affected by them. They generally extend for 10 or 20 degrees from the fixation point, and sometimes twice that distance. The extent of the area of the radiating lines is dependent on the brightness of the source of light and the retinal light adaptation. They are not seen in the area of the physiologic blind spot. But this cannot be sharply outlined, because that requires light adaptation, whereas the perception of the radiating lines requires dark adaptation.

Another optical phenomenon allied to that just described is the radiations seen diverging from bright lights; these are caused by the reflections of light from the moist edges of the eyelids. This manifestation also has not received the attention that its frequency entitles it to receive. These bands of light, extending upward or downward, or both upward and downward, may be seen on gazing at any

bright source of light when the pupil is wide enough to extend to the lid margins. Such bands of light have doubtless been observed by every one, but they have been regarded as only a kind of glare, which may be dispelled, changing the relation of the lids to the direction of the source of light; opening the eyes widely, or looking in another direction, or closing the eyes. The direction of the band of light is perpendicular to the direction of the part of the lid margin from which the light is reflected. If these reflections come from near the center of the lids, where the margins are parallel, one coming from the upper lid will go directly down, and one from the lower lid will point directly up. If the reflections come from the lid margins near either canthus, they take correspondingly oblique directions. When the lids are almost closed, their margins are so nearly parallel to the direction of the light rays that can reach them that these reflections are not noticed. When the eyes face a very strong light, the pupils contract, so that the reflections from the lid margins do not reach the pupil. When the pupil is dilated, the light reflected from either or both of the lid margins is an important part of the glare that patients complain of as the effect of the use of mydriatics. When we look at the reflections of the sun from the curved surfaces of an automobile, the reflections from the lid margins may be seen along with the radiating lines of the reflections from the anterior pole of the lens. The breadth and direction of the lid reflections distinguish them from the radiating lines caused by the lens.

It is probable that the reflections of strong light from the lid margins and the crystalline lens to the interior of the eye have an important influence on the metabolism of the retina. They diminish the excessive brightness of images formed on one part of the retina, and distribute

a part of the light to all portions of the pigment layer of the retina, without preventing the perception of retinal images useful for vision. They should be considered in relation to retinal nutrition, or light and dark adaptation.

We cannot assume that only the light coming from a strong visible source, like the sun, is reflected in that way. The light from every source, including the diffuse light of the sky on this same reflecting surface, is reflected in the same way. With feebler sources of light, however, the radiating lines in which they are reflected would not be perceived by the retina, constantly adapted to the total light falling on it. In this way a large part of the light entering the pupil is uniformly diffused over the pigment layer of the retina.

From the enormous influence on plant life of light falling on the chlorophyl and allied substances in the leaves we can best conceive the importance of this diffuse light constantly falling on the pigment layer of the retina. The loss of visual acuity, when the percipient layer of the retina is separated from the pigment layer by detachment of the retina, gives us an idea of the vital importance of the normal retinal pigment in the mechanism of vision. The same lesson is enforced by the defective vision always found with albinism, which impairs the choroidal and retinal pigmentation of the eyes. The physiology of vision is so complex and unexplored a subject that we need every possible assistance, by the subjective

study of our own vision, to help us assign the relative importance of measures available for ocular therapeutics or preventive medicine.

The subjective study of the reflection of light from the crystalline lens may also be of diagnostic importance. Pursuing the line of entoptic investigation described by Donders, studies of the writer's own eyes have revealed unsuspected opacities in both crystalline lenses near the anterior poles. Through an aperture 0.5 mm. in diameter the opacities were observed to be always of the same shape, they were seen very close to the anterior pole of the lens, and were brownish-gray in color. In this case, these have probably been left by a long-completed process. But lesions detected by this method of examination might be watched through their early active changes, when they would reveal something of their nature and causation. The lens substance, highly specialized and generally remaining transparent for many years, is a tissue about which we know little, and which we should study in order to be able to prevent cataract formation.

Subjective study of phenomena in the borderland between vision, neurology, and philosophy may also be a corrective, for there is a tendency for examinations of patients to become habitual, routine, and unproductive. It may help us to learn to retard the development of senile changes, and to avoid professional failures and disappointments.

Republic Building.

DISCUSSION

DR. W. B. LANCASTER, Boston: The conventional idea of a lens pictures the rays of light from a point P falling on the lens and then all of them focused to a point P' on the other side of the lens. This is not even approximately true. The

rays falling on the lens are correctly represented as all emanating from a point P, but after refraction these rays do not all go to the point P'. If we take the central ray and the two adjoining it (an infinitely small beam), these do meet at

a point, but none of the peripheral rays are refracted to this same point. The result is that we have a congeries of rays crossing one another, not all at one point, but at many points. Much the same is true of the eye. The rays from a point after refraction by the cornea and the lens do not meet at a point. If the pathway of the rays is studied, it is found that the rays are grouped together so that if cross sections are made at various points by letting the rays fall on a screen and observing the images when the screen is at different distances, it is found that, at a point slightly posterior to the schematic focus, the rays are well concentrated at the center, but are surrounded by scattering rays like whiskers, which Dr. Jackson spoke of as radiating sometimes 20 degrees or more from the center. If instead of a bright light as a source a black spot on a white card is chosen, these whiskers are invisible—too faint to be seen—and we obtain a pretty accurate focus in the center.

If the screen was in front of the schematic focus, then the grouping of the rays would be most concentrated, not in the center but around the circumference, the light being fainter in the center (negative aberration). That does not give a good image.

What the accommodation has to do is to pick out the place somewhere between the anterior and the posterior part of the focal line, as it has been called, where the image is the best for seeing, and that is what the eye is doing all the time, making the best use it can of the muddle of rays by picking out for the retina that cross-section of the beam which, under the conditions, makes the most serviceable image. If you paralyze the accommodation, the eye is unable to select the best place. Moreover, with the enlarged pupil, numerous extra rays are admitted which complicate the picture and compel

the eye to select a different point for the best focus. Dr. Crisp made a very keen observation when he stated that in this mixture of rays the eye has a habit of selecting one place which suits it the best, and when, by dilating the pupil, we introduce other rays at the periphery of the pupil, the eye still is able to adhere to its original preferred point, but I do not think we ought to count on that. The eye may do that in some cases, but if we want to learn what the eye does, we must examine it under the conditions in which it is really working, and not limit these at any rate to the conditions under cycloplegia, because then the aberrations are quite different and the eye must make a different adjustment.

DR. EDWARD JACKSON, closing: This subject is new to me, and is probably new to most of the members of the Society, but it seems to be a subject of importance. These aberrations of light coming into the eye, which I have described, are common to all eyes. I have tested many persons on seeing radiating lines about the reflections from an automobile. You cannot drive a block in any city on a clear day without encountering them; and these reflections from the sun are bright enough to be seen by our ordinary light-adapted eyes. I have studied them in my own eyes preferably with an opaque disc, with three small holes drilled into it: one, 1 mm. in diameter; one, 0.5 mm. in diameter; and one, 0.25 mm. in diameter. I thus study the divergence of the rays from the point of light, when everything else is cut out by a black diaphragm. The 0.5-mm. diameter opening in this metal disc is, perhaps, the best one to work with. The 0.25-mm. diameter is somewhat small.

By this manner of examining my own eyes I have discovered a defect in each lens near the anterior pole. I have vision such as is ordinarily recorded 1.3 with

my correcting glasses—as good as I had when I was 30 years old, but I discovered a point of partial opacity. There is a brown partial opacity near the anterior pole of each lens. I have had my eyes examined with a corneal microscope by a colleague who could see the opacity in each lens. That is a clinical matter. I do not believe the opacity in my lenses is of much practical importance, but we can learn something about opacities of the

lens by studying them on ourselves with a brilliant point of light, reflected from some surface. By shutting off the mass of light in general that is received on the retina from an object, we get a dark field in which are the radiating lines caused by reflection from the anterior pole of the lens near the center of the pupil. The radiating lines are best seen when the light is admitted as near as possible to the anterior pole of the lens.

ERYTHEMA NODOSUM WITH NODULES IN THE CONJUNCTIVAE

A CASE REPORT

LOUIS S. GREENE, M.D., AND MATTHEW WHITE PERRY, M.D.
Washington, D.C.

We have observed a patient with erythema nodosum complicated by nodular lesions in the conjunctiva of each eye. A search of the medical literature reveals few references to such an occurrence and, in view of this, it is thought worth while to report the case.

CASE REPORT

Mrs. E. E., an American housewife, aged 54 years, was first seen by one of us (M. W. P.) in September, 1935. At that time she complained of exhaustion. A thorough study revealed little except hypertrophic changes in the tonsils and injection of the pillars. Examination of the various systems was negative. Routine examination of the blood and urine revealed no abnormal findings. The blood Wassermann and Kahn tests were negative. A tonsillectomy was performed, following which she improved symptomatically.

Two months later the patient presented herself complaining of an inflamed condition of both eyes, of one week's duration. There was no discomfort connected with this condition and there was no pain produced by motion of the eyeballs in any

direction. Though she had quickly recovered from the tonsillectomy, she stated that the right side of her throat had been sore for a few days. She also complained of some soreness in both knees. Examination of the eyes at that time (L. S. G.) yielded the following results: Vision in each eye, with myopic correction was 6/6. The corneae and irides were normal. The pupillary reactions and muscular balance were normal and the media were clear. On external examination there was no swelling nor thickening of the eyelids, and the tarsal conjunctivae were normal. Situated over the insertion of the four recti muscles in each eye there was a triangular, cherry-red area of hyperemic conjunctiva with its base at the limbus, spreading out fan-shaped as far back as the equator of the eyeballs. Under the slitlamp these areas presented a superficial wide-meshed network of vessels of a dark cherry-red hue, confined solely to the bulbar conjunctiva (fig. 1). The areas were freely movable over the sclerae, which were both normal in color and texture. Located at about the center of each of these areas were from two to four nodes the size of a small pinhead. Under high

power each node appeared to be situated in a slightly sanguineous fluid through which could be seen a network of small vessels surrounding each node. One or two of the nodes showed slight staining by fluorescein. An intradermal tuberculin test was negative.

nodules and the erythema nodosum gradually disappeared, becoming completely absent approximately four weeks after their appearance. Fever coincidentally disappeared.

Eight weeks after the onset of the illness the patient had completely recovered.



Fig. 1 (Greene and Perry). Erythema nodosum with nodules in the conjunctiva.

Five days later, for the first time, the patient was found to have slight elevation of her temperature. She complained of pains in the joints and general malaise. On examination the pharynx was diffusely reddened. There was slight swelling and pain on motion of the ankle, wrist, and knee joints. Over the extensor surfaces of the arms and legs below the elbows and knees were scattered the typical reddened nodules of erythema nodosum. She was given sodium salicylate (45 gr. daily) and advised to remain in bed. Hot throat gargles were prescribed.

One week later the arthralgia had improved. There was little change in the erythema nodosum and no change in the ocular nodules. For the next three weeks she continued to have low-grade joint pains and slight malaise. Her temperature showed daily elevations as high as 100°F.

Over this three-week period the ocular

She no longer complained of the joint pains and her temperature had remained normal. There had been no recurrence of the nodules in the skin or eyes. Throughout this entire time she had continued to take sodium salicylate.

She has been seen at intervals to date (July 1, 1938) and she has had no recurrence of the disease.

COMMENT

Reports of ocular nodules appearing concomitant with erythema nodosum have but rarely appeared in the foreign literature, and in so far as we can determine are absent from the American literature. Reis,¹ in 1906, and more recently Schieck,² have commented on the occasional appearance of a triangular nodular area in the eyes of persons with erythema nodosum. Beaudonnett,³ Weltistscheff,⁴ Rotth,⁵ Rameev,⁶ and Krachmalnikov⁷ have each described one or more cases

of erythema nodosum with hyperemic and movable ocular nodules which appeared and disappeared together with the skin nodules. The similarity in these independently described cases is striking. Feigenbaum⁸ has also reported four cases of erythema nodosum with ocular involvement, the author terming the unusual complication "metastatic furuncular episcleritis." The patient in one of these, a middle-aged person, in addition to the skin disease and a "florid episclerotic nodule" in the left eye, suffered with acute inflammatory disease of the joints. Involvement of the joints appeared in this patient together with that of the skin and eyes. All symptoms completely disappeared following the administration of salicylates. Carstein⁹ has also reported a similar case, the patient being a middle-aged person who, in addition to erythema nodosum and "elevated reddened patches in the region of the limbus of both eyes,"

developed acute polyarthritis with the onset of the disease. These two cases seem nearly similar to the one described by us.

The nature of the ocular nodules, seen in these cases and in the one observed by us, is a question of considerable conjecture. Their physical characteristics seem not dissimilar from the characteristics of skin nodules. Both are of purplish-red color and movable. Their simultaneous appearance and disappearance seem significant. It seems reasonable to suppose, therefore, that the mode of production of the nodules in each location is of a related, if not identical, nature.

SUMMARY

A case of erythema nodosum with nodules in the conjunctiva is reported.
1710 Rhode Island Avenue.
800 Sixteenth Street, N.W.

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SHALL WE USE CYCLOPLEGICS?*

WILLIAM H. CRISP, M.D.

Denver

Among ophthalmic physicians there has been a somewhat general agreement as to the desirability of using cycloplegia in the majority of refractive examinations. Some optometrists condemn cycloplegia, and present to the layman a dark picture of the dangers that accompany the instillation of cycloplegics. That such propaganda is purely selfish in character can hardly be doubted. Moreover, if the law were modified to allow optometrists to use cycloplegics, they would be the first to announce the advantages to be gained to their customers or patients, and would promptly avail themselves of such legal sanction.

There are a few ophthalmologists who, while they do not condemn the use of cycloplegia in refractive work, nevertheless consider the general use of cycloplegics unnecessary for even objectionable.

One may readily acknowledge that it is not absolutely necessary to resort to cycloplegia in every refractive examination, even in fairly young persons, although very few ophthalmologists venture to deny the necessity of employing cycloplegia in children of preschool age. The question is, would a general disposition to give up the use of cycloplegics in adults serve or disserve the public interest?

I have repeatedly asserted that no one can be regarded as an expert refractionist who could not make an approximately accurate measurement of the refractive error without cycloplegia in most of his patients. It is to be regretted that many medical refractionists do not make a careful analysis of the patient's refraction

until the ciliary muscle has been paralyzed, and then base their measurements almost entirely upon the retinoscopic findings, supplementing these findings, at best, with a hurried and inadequate check-up of the corrected vision at the trial case.

Let us consider the three types of refractive error, two or all of which may, of course, be present in the same patient. Taking first myopia, it has often been stated, and with some degree of accuracy, that myopic errors can usually be estimated correctly without the aid of cycloplegia. This is perhaps truer of high amounts of myopia than of low amounts.

It is an important principle of refraction work that an eye that exhibits a small amount of error is more likely to suffer from eyestrain than one with a high error. It is too generally assumed that low as well as high myopic errors do not cause eyestrain. But I have repeatedly found symptoms of eyestrain in cases in which both eyes showed very low myopic errors, even when unaccompanied by astigmatism. The reason for this may be found in the tendency of patients with a moderate amount of myopia to attempt to improve vision by habitually squeezing the eyelids together. Such a habit may give rise to important mistakes or to uncertainty in the measurement of the refractive error. The use of cycloplegia tends to overcome this habit and so affords greater accuracy in making the refractive measurement. It should be remembered, too, that myopic eyes are often benefited by the rest that cycloplegia affords.

A further objection to the indiscriminate omission of cycloplegia in myopia consists in the fact that many patients

* Presented at the Seventy-fourth Annual Meeting of the American Ophthalmological Society at San Francisco, California, June 9, 1938.

have either an inequality of refractive error as between the two eyes or a combination of astigmatism with myopia, or both conditions. Any one of these combinations favors the development of a habit of straining the eyes or eyelids in an attempt to secure better vision, and in this way defeating the efforts of the examiner to discover the exact refractive error.

In regard to hyperopia, there is less tendency to deny the advantage or necessity of employing cycloplegia. I do not feel that the distinction is an entirely logical one or is altogether borne out by experience. In the majority of hyperopic cases a careful preliminary test without the aid of cycloplegia discloses either approximately the same amount of hyperopia as is subsequently determined with cycloplegia or within one fourth of a diopter of that amount of hyperopia. This is not to be understood as stating that I do not find significant differences under cycloplegia; such differences often appear in the form of altered measurement of the amount or axis of astigmatism. On the other hand, a fair number of cases of myopia will display one fourth of a diopter less myopia under cycloplegia than without it.

True, there are a few cases of hyperopia in which the error found under cycloplegia is much greater than that found without cycloplegia. These are the patients in whom the problem presents itself as to whether to give the full correction for the error found under cycloplegia; in other words, whether to face the possibility of having to climb down or that of climbing up from the amount of hyperopic prescription at first given.

My statement as to the large proportion of cases of hyperopia in which I find almost or quite as great an amount of hyperopia before as after the use of cycloplegia may arouse question or criti-

cism. To obtain such results it is necessary to make thorough use of the fogging method and of the astigmatic dials or cross-cylinder tests, or of both; and, above all, to supplement the usual fogging technique with final fogging of both eyes simultaneously. It is well to remember that the patient will use his prescription for both eyes together instead of singly—a most important reason for ascertaining the amount of hyperopia as disclosed by fogging both eyes simultaneously.

Especially when we come to the measurement of astigmatism are we likely to find important differences between the correction without and that determined with cycloplegia. Without cycloplegia, careful estimation of strength and axis at the trial case may frequently lack definiteness or accuracy. It may be asserted that in such cases the examination without cycloplegia is sometimes more accurate than that made under cycloplegia. My own experience has occasionally, but by no means usually, borne out such an impression. In spite of the fact that the astigmatic error very often, or even usually, varies in different parts of the same pupil, there is good reason to suppose that for perfect vision the brain commonly selects a limited area of the pupil, whether or not the pupil is dilated. I believe that in most eyes this selected area remains approximately or precisely the same under all the varying diameters of the pupil, including the temporary marked dilatation under cycloplegia. The chief advantage of cycloplegia thus lies in relaxation of the ciliary muscle, rather than in the opportunity afforded for exact retinoscopy.

There are a few patients in whom the loss of time incident to the use of cycloplegia is an important factor, or in whom the prejudice against cycloplegia is insurmountable. The inconvenience is usually less than was anticipated, especially

as regards homatropine, and particularly if eserine is used to counteract the ciliary relaxation. Now and then, in cases in which it is found necessary to use hyoscine or atropine, I instruct the optician to supply a temporary supplemental pair of +2.50 diopter spherical lenses for close work.

In some adults who show special resistance to the use of cycloplegia, one may try the effect of using a 2-percent-cocaine solution a half hour before beginning the test, instructing the patient to keep his eyes closed during the interval. Many of our difficulties arise from habitual pressure by the eyelids in the patient's attempt to obtain clearer vision. In such cases a mild solution of cocaine is valuable for the increased palpebral opening which it produces, and for the associated relaxation of eyelid pressure. With Beach's combination of Benzedrine (amphetamine sulfate) solution with a reduced quantity of homatropine, my experience has been somewhat inconclusive.*

The argument as to the toxic effect of cycloplegics has very little weight. In this age of the use of the tonometer for measuring intraocular tension, no one should fall into the error of administering numerous doses of a cycloplegic to a patient with incipient glaucoma. In very doubtful incipient cases of glaucoma it may be an advantage to cause a rise of tension under homatropine, for in this way the diagnosis may be rendered more certain and the indication for therapeutic measures may be more definite.

As to the occasional case in which there is sensitiveness to homatropine, or even to other cycloplegics, this may be managed by observance of the rule to which I have called attention elsewhere; namely, that the cycloplegic should be administered shortly after the ingestion of a

meal. If this rule has not been observed, the tendency to nausea, unsteadiness, or other related symptoms may often be very readily overcome by having the patient take food immediately.

Except in cases in which we must face the alternative of either working without cycloplegia or abandoning the patient to his own devices, it seems to be much safer to make the use of cycloplegia a routine measure than to use it only exceptionally or not at all.

The general relaxation of eyes under cycloplegia seems often to be more complete several hours after administration of the cycloplegic (namely, at a time when the accommodation has partly returned) than within the first hour or so, when the loss of accommodation was at its height. This difference may be due partly to a cerebral reaction, the brain having more completely broken away from the constant attempt to obtain clear vision. Be this as it may, another examination several hours after the first under cycloplegia is often most useful in checking up doubtful details.

The question of how much of the difference between the precycloplegic and the cycloplegic test is to be prescribed must be decided by each ophthalmic physician according to his personal experience and predilection. To each one who is debating this question I would say: Be sure that you have used the fogging technique, including bilateral fogging, to its full possibilities. I should like further to urge the method of fogging even under cycloplegia, in order to avoid being misled by any fraction of unrelaxed accommodation.

Sometimes, after examining in succession several cases that show agreement between the precycloplegic and the cycloplegic test, I encounter a patient for whom, for some reason, I have prescribed lenses without cycloplegia, but in whom complaint leads to reexamination under

* Further experience with such a combination, using 5-percent homatropine solution, has been on the whole very satisfactory.

cycloplegia, with marked change of correction and greatly increased satisfaction to the patient.

A recent interesting experience was the case of a highly intelligent schoolgirl, 15 years old, in whom I had used homatropine without getting much difference from the precycloplegic examination. The correction thus found gave some but not complete relief from eyestrain. The patient had a moderate compound myopic astigmatism. I subsequently resorted to hyoscine, 1:240, and found in the right eye 0.25 D., and in the left eye 0.37 D., more astigmatism, with slight modification of the axes. The change made the patient much more comfortable. Contrast such an experience with the statement made by Gjessing, about 10 years ago, to the effect that "the use of weak cylindric glasses, which in the United States of American is so 'modern,' is certainly in many cases entirely useless."

A second instructive case was that of a 64-year-old lawyer who, without a cycloplegic, and in spite of repeated careful tests, varied from 177 degrees to 5 degrees in statement of the axis of a -5.00 D. cylinder. Under homatropine, 2.5 percent, instilled six times the axis of this his only good eye gave a steady record at 180 degrees.

May I stress here that the advantages which might have been derived from the cycloplegic test are too often sacrificed through an exaggerated fear of the patient's inability to become accustomed to wearing any greater correction than that readily accepted by each eye at the postcycloplegic test. Some refractionists never prescribe a full correction for the amount of hyperopia found under cycloplegia, and I have even seen a hyperopic converted into a myopic prescription, the result of a hurried postcycloplegic test.

Courage as well as understanding on the part of the refractionist is necessary. Too many workers fear the struggle with

a reluctant patient. In children the intelligent coöperation of the parents is essential and is not always easily secured. It should not be forgotten that the patient's most difficult time is likely to be just when the effect of the cycloplegic drug is wearing off, for at that time the accommodative power has been only partly restored, and the strain placed upon this incomplete power of accommodation is particularly apt to set up a spasm which blurs distant vision. The final conclusion as to the practicability of a full correction should not be arrived at until after the glasses have been worn constantly over a prolonged period.

Some of the grossest refractive mistakes are committed in dealing with cases of strabismus. If a full correction as found under cycloplegia is ever necessary, it is in the case of convergent strabismus. The correction here prescribed should be precisely that found for each eye, regardless of the presence of amblyopia in one eye. It is altogether illogical to correct fully the amblyopic eye, and at the same time to undercorrect the better eye; or, on the other hand, to correct fully the amblyopic eye while overcorrecting the seeing eye, in the hope of making the two eyes see equally. Both eyes should be corrected on the principle of making them emmetropic in optical construction in combination with the correcting lenses, and by no means on the false principle of giving them both equally poor vision with correction. Only by such artificially produced emmetropia can the brain be given opportunity to coöperate upon the basis of the accommodative effort required.

I do not believe that we can afford to neglect the advantages to be derived from the use of cycloplegia, although in case of necessity we should be competent to make a noncycloplegic examination with the greatest possible accuracy.

530 Metropolitan Building.

DISCUSSION

DR. GEORGE F. LIBBY, San Diego, California: Dr. Crisp has given an excellent paper. I want to mention one point that we both learned from Dr. Edward Jackson; that is, in using homatropine to obtain cycloplegia it has been the custom of all three of us to use a 3-percent solution, warmed to about body temperature, and applied by raising the upper lid and putting a drop at the upper margin of the cornea. Dr. Jackson believes—and I am inclined to agree with him—that we secure better absorption by putting homatropine at the upper edge of the cornea, and holding the upper lid until the solution trickles down over the corneal surface. It has been our custom to instil one drop in each eye every five minutes until six drops have been instilled into each eye. By that method we feel that we obtain complete and satisfactory cycloplegia.

I want to mention one other point that the late Dr. Robert L. Randolph advocated, that is, the instillation of a drop of 0.25-percent solution of eserine after each refraction under cycloplegia. It gives the patient comfort and reassurance, and removes any element of danger from the cycloplegic.

DR. W. B. LANCASTER, Boston: I agree with Dr. Crisp that there is a too general adoption of the belief that cycloplegia should be used in almost all cases, especially in children, and I should like to adduce some additional arguments in favor of omitting cycloplegia in many cases.

What do we use cycloplegia for? We use it to control accommodation. Why do we wish to control accommodation? Because accommodation, by contraction and relaxation of the ciliary muscle, changes the refraction which we are trying to measure, increases myopia, and decreases hypermetropia. For instance (I am going

through the A B C's to start with), suppose a patient at the age of 20 is examined without a cycloplegic and we find in the right eye +2 D. with vision 6/5, and in the left eye +2 D. with vision 6/5, and, testing both eyes together, +3 D. with vision 6/5. If we gave a cycloplegic, perhaps we might obtain a vision of 6/5 with four diopters. What difference would that make in your treatment? You certainly would not give four diopters correction in a patient 20 years of age who had never worn glasses. One would give somewhere between two and three diopters, according to various conditions that the case might present, so that in this case cycloplegia has not given any help.

You would perhaps retort, "Yes, it has given me a good deal of help because it has shown me that there is no astigmatism." How does accommodation affect astigmatism? The best book in German on accommodation and refraction is the one by von Hess. He states that accommodation is not capable of producing astigmatic change in the lens so as to correct an astigmatism. Duke-Elder, who has written the best textbook in English, is of the same opinion. Accommodation—contraction of the ciliary muscle—does not produce an astigmatic change in the lens so that it can correct existing astigmatism. Luedde, who, perhaps, has given more attention to this subject than any one else in this country, is very positive in this regard. We know that accommodation can neutralize astigmatism in some cases, but it does not do this by an unequal contraction of the ciliary muscle producing an astigmatism of the lens which corrects an existing astigmatism. It simply moves the whole conoid forward or back so that different portions of it fall on the retina. If the interfocal circle falls on the retina, then all the lines will

be equally distinct or equally slightly blurred, but accommodation does not neutralize the astigmatism by an unequal contraction of the ciliary muscle. If it did, it would be easy to determine the fact. I reported a case before this Society about 20 years ago in which I did measure this, or rather, in which Souter measured it for me, but that was a very unusual case—a case of paralysis of the third nerve.

DR. HARRY S. GRADLE, Chicago: May I take the liberty of differing with some statements that Dr. Lancaster has made as regards the lack of necessity for the use of cycloplegics in the majority of cases? Patients come to the ophthalmologist for the last word regarding their eyes. It is true that a large percentage of them can be refracted adequately without cycloplegia, but it is equally true that no eye can be examined thoroughly without the use of a cycloplegic. I believe that it is necessary for the ophthalmologist to know more about any eye that comes to him than any general or nonmedical practitioner can know about such an eye; and, secondly, it is necessary not only for that individual eye, but also as a preventive against future trouble, to use cycloplegia. A large percentage of blindness could be prevented by the early use of cycloplegia, particularly in the early detection of glaucoma. I do not believe that the American Ophthalmological Society should go on record as opposing the routine use of cycloplegia for the examination of the eyes.

DR. EDWARD JACKSON, Denver: The question of whether or not to use cycloplegics depends on whether we want to know all that we can know about the eye for which we are prescribing; or whether we are content to follow certain rules that have been laid down for us, without ascertaining what conditions might be disclosed about this particular eye or this

particular patient. We can always learn more by the use of cycloplegics than we can learn without them.

The use or the nonuse of cycloplegia often depends on the patient's resistance to its employment. We should know certain things and consider them with reference to the eye under cycloplegia. A partial correction is not a correction of the error of refraction. Every patient with a partial correction of myopia that I have seen supplemented this partial correction by looking obliquely through his lens. In this way he obtained the effect of a stronger lens, but often at the cost of inducing astigmatism, which was against the comfortable use of his eyes. Patients, however, learn this trick in order to see better, and avail themselves of it. The same effect of looking obliquely through the lens is responsible for a large part of the dissatisfaction of the hyperopic who are given a full correction. When they gaze obliquely through the lens, they have an overcorrection. If we know all that we can know about the case, we can consider these things and are in a better position to reach a sound judgment as to what glasses are needed and how constantly they should be worn.

One other point is overlooked. Every one probably is able completely to relax his accommodation when he falls asleep. He can learn—and I have had this fully illustrated by many cases—to relax accommodation completely and see through his glasses more quickly than he can learn to use a lesser amount of accommodation and see clearly through partially correcting glasses. For patients in general an unaccustomed partial accommodation is more difficult than complete relaxation. Patients often endeavor to become accustomed to a partial correction, but are unable to see with the lenses after months of trial. When the full correction is given, however, with a little caution as to look-

ing through the center of the glasses, they will return in a few weeks to report that the lenses are satisfactory. Most persons can relax accommodation when they go to sleep, and it is easier for them to learn to relax accommodation and see clearly with the full correction, than to relax partially and see clearly with a partial correction.

DR. W. H. CRISP, closing: As regards Dr. Lancaster's comment on the patient who is supposed to show two diopters of hyperopia, taking each eye separately, and three with both eyes together, and four with cycloplegia, and Dr. Lancaster's statement that we should certainly not give him four diopters, I would say that I most certainly should, after I had warned him that he might have difficulty in learning to use the full correction. A patient came to me who had never worn glasses. Under cycloplegia he accepted +5.50 D. spheres at the trial-case. I did not want to make it too difficult for him, so I deducted a half-diopter and gave him +5.00 D. spheres. I told him he might have trouble in becoming accustomed to the lenses. Three months later he returned complaining of some residual discomfort. I tested him at the trial-case and he accepted +5.50 D. spheres again, so I gave him an extra quarter-diopter which brought comfort. To another patient who had worn +0.75 D. spheres I gave +1.25 D. or +1.50 D., and he was more dissatisfied than the patient who was given five diopters. You cannot tell until the patient tries, and surprises occur all the time. There are children who take

a one-diopter plus sphere and who, in spite of all the efforts of the parents to have them wear the glasses constantly, still show a definite blurring in reading the test letters after wearing the glasses for some time. We must decide for the individual case, but we are not giving the patient a fair chance unless we endeavor to have him wear the full correction.

Can accommodation correct astigmatism? It has been stated that it cannot. I do not know of anything that has been done to prove that accommodation cannot correct astigmatism. I do not believe that if you have a half diopter of astigmatism the accommodation is capable of correcting it; but suppose that by action of one part of the ciliary body the accommodative action can alter the astigmatism by only a quarter or even an eighth of a diopter—that patient is going to experience eyestrain. Even though the involuntary effort can only go one eighth of a diopter toward correcting the astigmatism, the patient may experience trouble from making this constant effort, and I am sure many eyes do undergo some such change part of the time. We must also consider the action of the eyelids in correcting astigmatism.

As to the use of eserine: here and there I find someone who uses not merely one drop of eserine, 1:240 solution, but two drops of eserine of that strength. I have instilled two drops, and some patients had a very uncomfortable time, so in the case of most adults and adolescents I merely use one drop after homatropine.

A GLARELESS ILLUMINATED HOLDER FOR VISUAL-ACUITY TEST CHARTS WITH VARIABLE INTENSITY OF LIGHT*

C. E. FERREE, PH.D. AND G. RAND, PH.D.

Baltimore

At various times we have been requested by members of state, municipal, and college health departments to give some attention to equipment for testing vision in the schools and for similar purposes. In particular we have been asked to try to devise an inexpensive, easily portable chart holder that would be completely glareless and would provide a glareless, well-distributed, even illumination of the test chart of a correct and standard intensity. It is our purpose in this paper to describe such a chart holder.

There are, in our judgment, the following needs for a careful selection of an equipment for testing vision in the public schools. (1) Customarily in school testing no attempt is made at a complete refractive correction. The test of vision must be depended upon entirely to indicate the condition of the pupil's eyes, to detect whether the condition is getting worse or better in case there is a refractive defect, and to decide whether there is need of reference for a medical examination. There is a poor chance to accomplish a satisfactory result if the conditions of making the test are not standardized and uniform from time to time and from place to place. For example, we find there is great uncertainty at the present time as to just what is normal acuity for children at different ages. The feeling of uncertainty is due to the fact that it is well known that the conditions of making the test are not the same from time to time and from place to place in examining the same child. Also, if the test conditions are not satisfactorily standardized, one cannot tell in examin-

ing the child in different years of his school life whether his condition is the same, better, or worse. From this it can readily be seen that careful attention to consistency in vision testing is more important in the schools than it is to the doctor in his routine practice. That is, the doctor is prepared to make a complete refraction and does not, therefore, have to depend so much upon the standardization of his conditions for testing and rating vision. Further, the refractionist's job is to give the best vision it is possible to obtain by means of a correcting glass providing there are no auxiliary reasons for prescribing otherwise, and in consequence he is not so dependent on what is accepted as the normal rating of vision nor on any previous rating he has made. (2) There is a great deal of practical and scientific need for knowing what vision is at different ages and what should be considered the norms of vision at these ages, particularly during the formative period and beyond middle life. In this we are personally very much interested, and it is one of our strongest motives for trying to secure standardized and correct test equipment. Very important means of obtaining a part of this knowledge are the examinations that are made systematically in the schools—grade, high school, and college.

The two most important variable factors in vision testing are (a) type of test chart used and lack of uniformity in these charts, and (b) intensity of illumination of the chart and its wide variation from place to place and time to time. Of these the more important is intensity of illumination. Apparently the testing from the kindergarten through college is in a

*From the Research Laboratory of Physiological Optics.

very unfavorable condition. A great variety of test equipment is being used, and very little attention is paid to the standardization of the illumination of the test charts. Results obtained under these conditions are, of course, of little value from the standpoint of comparative ratings or the determination of anything approximating a set of norms.

The lighting device which is used on our chart holder consists essentially of two boxes of special construction and of suitable location in relation to the surface to be illuminated. It was planned for three purposes: for the illumination of pulpits and speakers' desks, for the illumination of test charts, and for the illumination of music racks. It is the application to test charts alone that will be discussed in this paper. This application is shown in figure 1.

In figure 1 are given (a) an outline

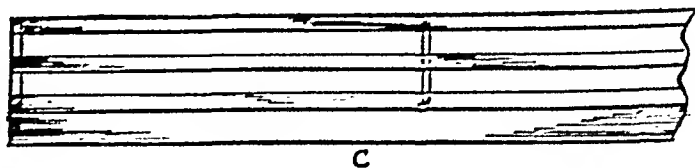
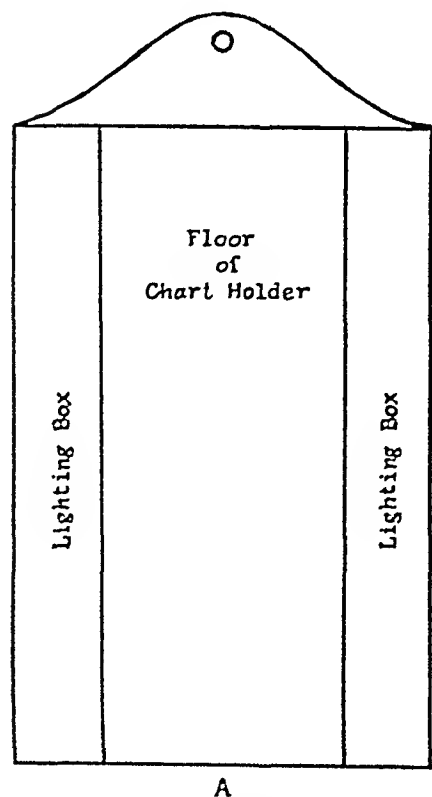


Fig. 1 (Ferree and Rand). A, an outline drawing of the chart holder showing the location of the lighting boxes and their relationship to the surface to be illuminated. B, drawing showing a cross section of the chart holder. C, drawing showing a set of the vanes or glare baffles used on the inner side of each lighting box.

drawing of the chart holder showing the location of the lighting boxes and their relationship to the surface to be illuminated, (b) a drawing showing a cross section of the chart holder, and (c) a drawing showing a set of the vanes or glare baffles on the inner side of each lighting box. In figure 2 are shown larger lighting boxes of the same type built into a portable unit for use on lecture tables and speakers' desks.

Some of the faults in the present illuminated chart holders are: excessive glare from the lighting device; glare on the surface of the chart; a very uneven and poorly diffused illumination on the test surface; high light and brightness on the lateral edges of the chart and near to the illuminating units; an unstandardized and a too high intensity of light; and lack of portability.

Our chartholder has been especially designed to correct all of these faults. This has been accomplished in the following ways:

(1) The eyes are shielded from glare from the lighting units by vanes or glare baffles, properly inclined, on the inner side of each lighting box. Further to complete the glare protection, both surfaces of these vanes are surfaced in flat black.

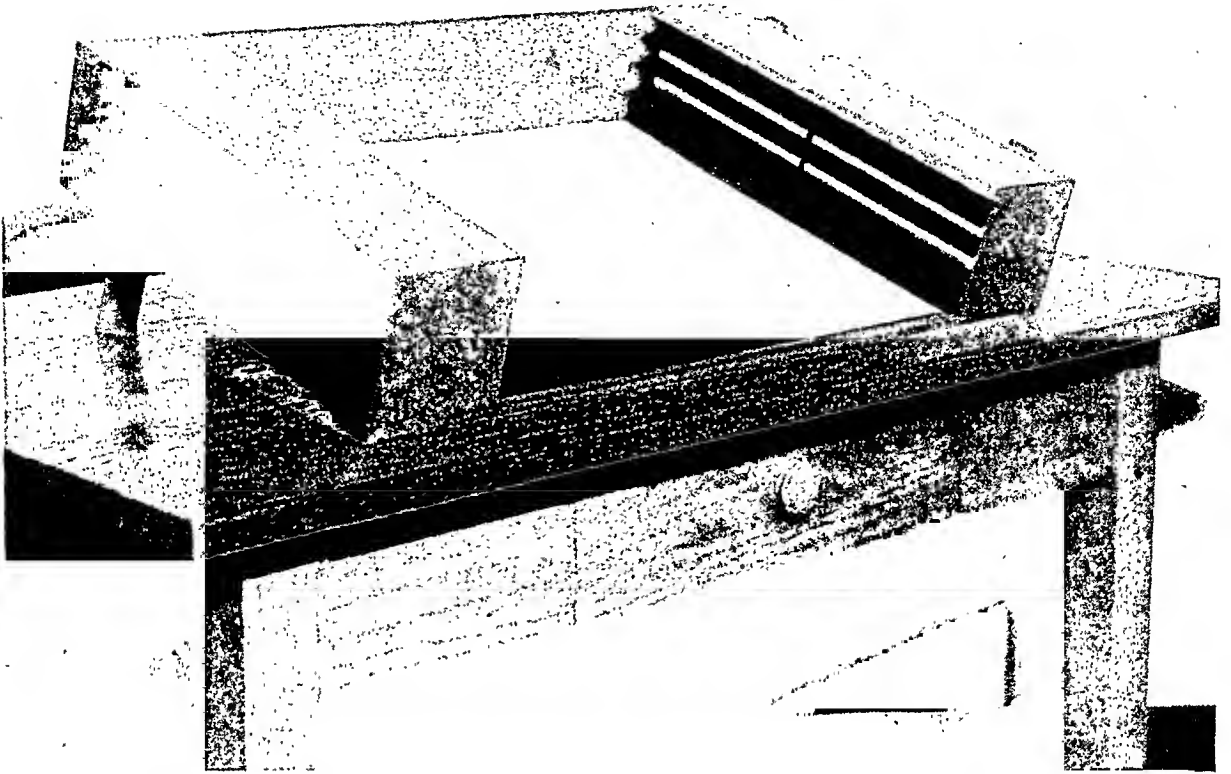


Fig. 2 (Ferree and Rand). Large lighting boxes of the same type as are shown in figure 1, built into a portable unit for use on lecture tables and speakers' desks.

(2) Diffusion of the light is secured by placing behind the vanes a plate of diffusing glassware, probably Celestialite glass, because this glassware not only gives excellent diffusion of the light but also all the color correction that would be needed. It is a comparatively thin plate, light in weight, made of 3-ply glass, the two outer plies of opal glass and the intermediate ply of blue glass. An etched plate of Daylight glass could be used, but this would be expensive.

Diffusion of the light is, of course, a very important factor in securing evenness of illumination of every part of the chart and of the floor of the chart holder. By minimizing specular reflection, this diffusion is also an important factor in eliminating glare from the test surface. The elimination of glare is further effected by the direction of light, so that none of the specularly reflected rays can

enter the eye. A still further benefit along this line can be obtained by covering the floor of the chart holder with white blotting paper or other mat material. This would be of service in cases in which the chart is not so broad as the floor of the chart holder. Diffusion, too, gives high visibility to the test objects themselves. For clear vision, light from every point in the object must be brought to a focus in the image formed on the retina. For this to take place, every point in the object must be adequately illuminated. Adequate illumination for each point is secured only with well-diffused light. Finally, the diffusion of the light serves to eliminate all shadows that might otherwise be cast by the inclined vanes.

(3) High light and high brightness on the floor of the chart holder near the two lighting boxes are prevented by a thin strip of metal of suitable breadth walling

off the luminous aperture up to the lowest vane. Thus the right side of the chart holder will receive its illumination chiefly from the lighting box on the left, and the left side will receive its illumination chiefly from the lighting box on the right. In the experimental model of the device, the vanes should be made adjustable in order to ascertain the exact angle of inclination at which they should be set to secure both glare protection and the proper direction or placement of the light. Direction of the light is further aided by an inclined, diffusely reflecting plate of Alcoa aluminum mounted at a suitable angle above and behind the lamps.

(4) In manufacturing the lighting boxes, the standardization of intensity can be secured through a careful selection, seasoning, and location of the lamps employed* and the use of diffusing glassware of the needed density. In this latter connection more than one plate of glassware may be used, the plates having the same or different densities, as may be required. The manufacturer has, of course, to see to it that this standardization is secured in all chart holders that are put on the market.

(5) Easy portability can be had by making the chart holder of thin, hard-sheet aluminum and using care in the selection of other material and in the construction to keep the weight down.

The holder should be made so that any standard chart can be used. The chart which we have recommended, however, as especially suited for the correct and reproducible testing and rating of vision is the double-broken circle chart described in a former paper.¹ In a later model the test objects have been rearranged so that all the sizes can be included, with a suffi-

cient number of each size, in a chart 10 by 28 inches.

The feature of variable illumination can be added, if desired, with very little change of construction. One of the advantages of adding this feature is the ease it would afford for securing the intensity that is chosen as standard. This advantage alone might render the construction of the holder less expensive than would be the case if the standard intensity had to be secured by the means noted in (4) above. The following change in the construction is all that would be required. An inside wall of thin aluminum could be added next to the diffusing plate. At a suitable height in this wall a longitudinal slot or aperture could be cut of suitable breadth and of a length almost equal to that of the boxing. In this aperture would be inserted a single vane of thin aluminum mounted along its central axis on a slender rod, the ends of which pass through the top and bottom of the boxing. On the upper end of this rod will be mounted a button by means of which the vane can be rotated. As the vane is rotated from a position normal to the diffusing plate to the parallel position, the intensity of light is varied from full to approximately zero. A good diffusing plate such as Celestialite glass will be quite sufficient to eliminate the shadow cast by the vane. With this construction it is quite probable that fewer glare baffles would be needed to shield the eye from the brightness of the diffusing plate, inasmuch as a smaller part of the plate is illuminated to a brightness. Perhaps, indeed, only one glare baffle would be needed.

An intensity scale can be provided as follows. On the top of the boxing may be mounted in upright position an arc-shaped rim of metal on the front surface of which graduations are marked. Beneath these graduations a slot is cut to

* Best results can be obtained with tubular lamps. These lamps are readily available in suitable lengths and wattages.

receive a pointer that is attached to the rod supporting the rotating vane. At the front end this pointer is bent upward to indicate the graduations on the scale. So positioned, the scale can easily be read by the examiner.

The holder should not be expensive to make. If light-weight aluminum is used and care taken throughout in the selection of the auxiliary material, the weight should not be more than 5 to 10 pounds.

With respect to the cardinal requirements: correctness of illumination, easy portability, and moderate cost, the holder will, we believe, give a high degree of satisfaction.

There is an important use of such a chart holder by refractionists. By preference many refractionists still use and always will use a printed chart. We do not hesitate to say that in our opinion and experience the best test conditions, particularly for visual acuity, are given by a properly illuminated printed chart. With it, a better state of adaptation may be had, a clearer definition of the test object, a better diffusion of light and a better background for seeing the test object than can be had by any other type of test equipment. Provided with the feature of variable illumination, ideal conditions for testing vision and for detecting and correcting errors of refraction are obtained with the printed chart.

In this latter connection the very great importance of making the test at low illumination will be remembered.² The refractionist who uses medium or high intensities of illumination for detecting errors of refraction is working against himself. By giving greater power to discriminate detail, the higher illumination enables the test object to be seen even when its image is blurred. It is not hard, for example, to convince a presbyopic subject with blurred images for near seeing, what the effect of high illumination is

on the clearing up of blurred images or, conversely, how impossible it is to see the details of near objects at low illumination. Obviously, then, when one wishes to detect small defects in the image or to decide which of two correcting glasses gives the better result, a low illumination should be used. This is particularly important in case of astigmatism when one is trying to decide what is the proper strength of correcting cylinder and the best placement of its axis.

The use of intensity of light in refraction is just the reverse of what it is in lighting. In lighting, intensity is used to compensate for errors in the formation of the image; in testing and correcting for errors in refraction, it is used in a way that will most clearly reveal these defects. In earlier days there was great confusion on these points. In refraction, as well as in lighting, the tendency was to use high intensity of light and to give the clearest vision of the test object. Happily, today we know that this is not the correct procedure.

This chart holder would also be of a great deal of service in all places or stations in which there is a problem of the accurate and reproducible testing of visual acuity; such, for example, as in motor-vehicle departments, in the testing of railroad employees, in the air service of the Army and Navy, and in the commercial air service. In all cases where there is a need of a standardized requirement of service, there is a corresponding need of a standard testing of fitness for that service.

Perhaps the most widely used test of human powers is that of acuity of vision. In proportion as it is widely used there is need to provide a foolproof equipment. As the situation now is, the testing of vision is one of the most loosely conducted tests we have. Not only has there been no substantial change in the princi-

ples and procedure of making the test since the days of Snellen, but even the principles laid down by him are not complied with in a very great part of the testing that is now being done. So far as restriction or supervision is concerned, almost any type of test chart may be used under any type or intensity of illumination. The variable difficulty of task to which the eye may be subjected under these conditions of testing is a sufficient guarantee that consistency of result will not be obtained in testing the same person at different times and in different places, and that the test will not serve the important purpose for which it is intended.

With respect to type of test chart, it may be noted that capital-letter charts are sold and used without difference or distinction, some having letters constructed to meet the 1 to 5-minute requirement of the Snellen rating scale and others not meeting this requirement even when manufactured and sold by the same firm. Moreover, letters of the same size selected for use as test objects may in the different charts of each of these types, set a very greatly different discriminative task for the eye. Inaccuracies in the dimensions of the letters used are also of frequent occurrence. In former papers^{1, 2} all of these matters have been discussed by us in considerable detail. We have discussed among other things the nature and principles of the visual-acuity test and what it should accomplish; the effect of type of judgment on the results of the test; comparative merits of different test objects, pointing out in particular the futility of trying to standardize the capital letters as test objects or to make of them a correct rating scale; the effect of intensity and composition of light on the results of the test; factors influencing the sensitivity of the test; and comparative merits of different ways of securing the test field.

Obviously the first step in reforming a bad practice is to provide test equipment that so far as possible will not permit of this practice and to make this equipment easily available to the public. It is with this purpose in mind that we have described in former papers, as already indicated, a test object and test chart that will give a correct and reproducible measure of the eye's power to discriminate detail, and in this paper an inexpensive chart holder which will provide proper conditions of illumination and will be easy and convenient to use in a wide variety of test situations.

SUMMARY

Some of the faults in the present illuminated chart holders are: excessive glare from the lighting device; glare on the surface of the chart; a very uneven and poorly diffused illumination on the test surface; high light and brightness on the lateral edges of the chart and near to the illuminating units; an unstandardized and a too high intensity of light; and lack of portability.

The chart holder described in this paper was devised to remedy these defects. A simple mechanical provision is also made for varying the intensity of illumination in continuous change from approximately zero to full without change in the color, composition, or placement of the light.

The following are some of the situations in which there is an important need for such a chart holder. (a) In all cases where there is a problem of the accurate and reproducible testing of visual acuity; such, for example, as in motor-vehicle departments, in the testing of railroad employees, in the air service of the Army and Navy, and in the commercial air service. A particular and very important case of this need is in the testing of vision in the public schools, where customarily

no attempt is made at a complete refractive correction and all knowledge of the pupil's eyes and all advances or recessions of any condition, refractive or otherwise, is dependent upon the testing of vision. Apparently this testing from the kindergarten through college is in a very unfavorable condition. A great variety of test equipment is being used and very little attention is paid to the standardization of the illumination of the test charts. Results obtained under these conditions are of little value from the standpoint of comparative ratings or the determination of anything approximating a set of norms.

(b) In the correction of errors of refraction.

By preference many refractionists still use and always will use a printed chart. The best test conditions, particularly for visual acuity, are given by a properly illuminated printed chart. With it, a better state of adaptation may be had, a clearer definition of the test object, a better diffusion of light, and a better background for seeing the test object than can be had by any other type of test equipment. Provided with the feature of variable illumination, ideal conditions for testing vision and for detecting and correcting errors of refraction are obtained with the printed chart.

2609 Poplar Drive.

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THE PRACTICAL MEASUREMENT OF ACCOMMODATION AND CONVERGENCE

HILMER G. MARTIN, M.D.

Milwaukee, Wisconsin

The measurement of accommodation and convergence need not be time consuming nor fatiguing to the patient in the performance of routine refractions.

To be guided by an accurate determination of the amounts of muscle function in constant use, their maximum functions, their reserve power, and their relationship to one another is by far more important than to regulate modification of the refractive correction by considering the position of rest alone.

An instrument, partially described in a previous communication,* has been devised to facilitate the measurement of the following functions in routine practice:

Interpupillary distance

Accommodation: expressed in diopters and read directly

Maximum: monocular and binocular

Amount in use at work distance

Range

Region

Relative: positive and negative elements, at any specified near-work distance

Reserve

Comparison of the near add requirement to accomplish equality in presbyopic subjects

Convergence: expressed in meter-angle terms and read from chart

Maximum

Amount required at work distance

Amount required at near point of convergence and accommodation

Amount required at any near point

Reserve at work distance or any

near-work distance

Amplitude

Comparison of accommodation in diopters and convergence in meter angles:

Maximum

Relative, at work distance or any near point

Reserve

APPARATUS

Three parallel rails, calibrated in diopters and marked in centimeters, are mounted upon a tiltable-beam unit and are adjustable in all directions. Lens cells and carriers for various indicia are mounted upon and are movable on the upper parallel rails. The instrument has been described and illustrated in the reference.

TESTS

Interpupillary distance: The lens carriers are set before the eyes at the mark "O" on the scales. The plano lenses with bisecting scratch marks are then inserted into the lens cells. Sighting from the ends of, and along the rail at the eye being tested (each is done separately), the centers of the lenses are made to coincide with the center of the pupils by raising or lowering the scales and bringing them in or out. The removable plate is then put in place, resting upon the upper surfaces of the rails with the spirit-level side toward the nose piece, the lens carriers having been moved along the scales a very short distance to permit placing the plate between them on the nose-piece. The lens carriers are placed in contact with the plate. Sighting through the upper open grooves, the interpupillary distance is

* Martin, H. G. *Amer. Jour. Ophth.*, 1938, v 21, Feb., p. 161.

read off in millimeters. The plate is then placed at the other end of the scale just in front of, and in contact with, the card carriers, and the scales are brought in or out, raised or lowered, to correspond with the pupillary distance. The plate is then removed.

ACCOMMODATION

Maximum Accommodation

Monocular. With one eye occluded, the patient is instructed to fix the gaze upon the test type on the card, which is placed well out along the scale. The examiner then slides the card carrier slowly along the rail toward the eye until the point is reached where the patient can no longer read the test type and the reading on the scale is taken in diopters. The opposite eye is then tested in the same manner. This is, of course, an application of the Prince-rule method. These tests are made without and then with the proposed correction in the lens cells. Referring to any of the textbook charts comparison with age normals can be made. Any difference between the case reading and that of the age-group normal represents in diopters the spherical strength necessary to bring the patient's maximum accommodation to the normal.

To determine the amount of accommodation required at any specified near-work distance in centimeters, the card carrier is moved to that point on the scale and the dioptric reading recorded. This reading is expressive of the dioptric spherical-lens strength at the specified distance normally required, or the amount of accommodation in diopters used by the emmetropic eye at this point. The binocular function will be considered later on.

Range and Region of Accommodation

The card carrier is placed at the extreme end of the scale and is then moved slowly toward the eye until the test type is just readable, and this point is read off

on the scale. Continuing to move the card carrier toward the eye from this point, the operator notes the point at which clear vision of the test type ceases. The difference between the two readings shows the range and also establishes the region of accommodation. In presbyopia and high degrees of hyperopia this is especially important, and that lens is given which permits of the greatest range or which provides the desired region. This test guards against overcorrection in presbyopia.

Relative Accommodation

These tests determine the maximum amount of accommodative effort that the eye can exert, and the maximum ability of accommodative relaxation at any specified distance. The former is spoken of as the positive, and the latter the negative element. Positive and negative relative accommodation can be tested at any specified near point within normal or corrected accommodative range by means of the instrument.

Negative Relative Accommodation

Each eye is tested separately. The card carrier is placed at the distance from the eye at which the determination of this function is to be made. A known plus spherical lens sufficiently great to blur the test types decidedly is inserted in the lens carrier before the eye to be tested. The examiner then moves the lens carrier along the scale slowly away from the eye and toward the test card to the point where the patient is just able to read the types, where the motion is halted and the dioptric reading taken. The test is repeated with the starting position of the lens well away from the eye and where the type is clearly readable. The lens carrier is then moved toward the eye until the indicia are no longer readable and the dioptric reading again is taken.

This is to check the former reading. The dioptric lens strength is subtracted from this scale reading and the remainder, expressed in diopters, is the amount of accommodative relaxation possible for the eye at this distance. It is, of course, necessary to correct for the amount of accommodation normally in use at this same distance. This can be read off on the scale at the point at which the card carrier is placed, and this reading is subtracted from the remainder just determined and expresses the *negative relative accommodation* at this specified distance.

Positive Relative Accommodation

Replacing the plus lens in the carrier with a minus lens of sufficient strength to blur the type, the test is conducted in the same way, by moving the carrier toward the test indicia until the type becomes readable, when the dioptric reading is again taken. The dioptric lens strength is subtracted from the scale reading; the remainder expresses in diopters the greatest amount of accommodative exertion possible for the eye at this distance. Correction is again made for the normal amount of accommodation in use at this distance, but this figure is added to the remainder just determined and the result is the *positive relative accommodation* for this specified distance.

Example: Let us suppose that the relative accommodation is to be determined for a distance of 33 centimeters.

Place the card carrier at the 33-centimeter mark on the scale. To test negative relative accommodation, place a 5-diopter sphere in the lens carrier, and slowly move the carrier away from the eye to a point where the type just becomes readable. Suppose this occurs at 11 centimeters, or 9 diopters on the scale. Subtract the lens strength, 5 diopters from 9 diopters. Four diopters, then, represents

the greatest amount of accommodative relaxation for 33 centimeters' distance. However, the normal amount of accommodation in use at this distance is found by reading the dioptric scale where the test card has been placed, in this case, 3 diopters. Subtracting this reading of 3 diopters from 4 diopters just determined, leaves 1 diopter, which is the negative relative accommodation.

To test *positive relative accommodation*, replace the plus lens with a minus-5-diopter sphere, moving it away from the eye until the type is clearly readable. Suppose this point is represented by 6.6 diopters on the scale. The difference between the dioptric lens strength, 5 diopters, and this reading of 6.6 diopters, leaves 1.6 diopters, which represents the greatest amount of accommodative exertion at this distance. Since the normal amount of accommodation in use at this distance is 3 diopters, this figure must be added to the remainder just obtained and the resultant, 4.6 diopters, expresses the positive relative accommodation.

The amplitude of accommodation is then also apparent for this distance.

To insure comfort, the positive must at least equal the negative element at the near-work distance.

This test is made first without and then with the proposed refractive correction. Indication is given for modification of the correcting lens to insure comfort.

The measurement of relaxation or exertion of accommodation at a specified near distance as tested by the method offered here, involves really the *continuous* exertion or relaxation of accommodation to the greatest extent. This effect was found to be more expressive of the actual limitations of these functions, inasmuch as the interchange of lenses of successive strengths, as commonly used, permits of a return to a previous lower

state of activity during these exchanges, often resulting in a fatigue reaction or a stopping-short of the limit of function. Again, if too high a lens strength is used initially, or if the progressive increases are too abrupt, a false end point is often taken as true. For instance, if a patient is able to overcome plus lenses until 4 diopters is reached, it will be found that if an initial lens of 3 diopters is used, the patient fails to overcome this strength even though the limit is actually higher. The method offered here has the advantage of imposing a constantly increasing load uninterruptedly.

The amount of accommodation in constant use, or the amount required at the patient's working distance, can be determined by placing the card carrier at the work distance, and reading this measurement in diopters from the scale. Having tested the maximum amount of accommodation of which the patient is capable, and comparing that figure with the amount of accommodation in constant use at the work distance, the amount of reserve accommodation is apparent. If the amount of accommodation in constant use approaches too closely to the maximum amount of which the patient is capable, the reserve is insufficient and symptoms of discomfort will appear. The existence of accommodative insufficiency or excess are brought out by these tests.

An important test in presbyopia consists in determining the far point of accommodation with the correcting lenses in place, each eye being tested separately. Reference is made, of course, to the farthest point of near-vision range, which should be nearly equal for the two eyes to preserve maximum comfort.

An interesting and important phase of accommodative function, especially in presbyopic eyes, is the measurement of the

Binocular Near Point of Accommodation

The card carriers are removed from the upper scales and, with both eyes uncovered, the patient is directed to fixate the test indicia on the card carrier on the lower and middle rail. This card is slowly advanced from a far position toward the eyes by means of turning the thumb screw on the side of the tubular unit. When the point is reached where the type is no longer readable, the dioptric reading is taken from the upper scale.

In young patients the monocular and binocular near points of accommodation are very nearly the same, but in presbyopic subjects, tested with the near refractive correction in place, the binocular near point of accommodation is definitely and consistently greater than the monocular. The monocular test is made with the visual axes parallel, but the binocular test involves convergence, so we may conclude that the convergence stimulus might account for the greater binocular near-accommodative power. The suggestion is offered that if the binocular near point of accommodation is greater (nearer) than the near point of convergence, there is alternate fixation, which may be too rapid to be observed grossly. The monocular near point is influenced by the state of pupillary contraction, of course, as evidenced by the increased near point when the pin-hole disc is used. For practical purposes, however, the state of the pupil as it obtains in the case under test and at the distance tested is really the guide for the establishment of functional power.

It has been noted in young patients that if the binocular is greater than the monocular near point of accommodation, the condition simulates that of presbyopia, and the positive relative accommodation is generally found to be low.

An increase of .50 diopter sphere or more addition, for near, results in a

greater monocular near point of accommodation; but the binocular is not necessarily increased, although the near point of convergence may be. In many cases, therefore, the binocular near point, with correction, is more important than the monocular reading in consideration of the convergence factor.

In cases of a degree of convergence insufficiency, the near addition which provides a seemingly insufficient monocular near point of accommodation will generally be found to give an adequate binocular near point of accommodation with complete comfort to the patient.

Regional Accommodative Amplitude

Since the term "relative accommodation" is considered by some to mean the relationship between accommodation and convergence for specific distances, the term "regional accommodative amplitude" is perhaps more descriptive, and comments refer to what has been called "relative accommodation" in this paper.

Binocular Relative Accommodation (or binocular regional accommodative amplitude)

With both eyes uncovered, the patient is directed to fixate the indicia on the middle scale card, which is placed at the same mark on the scale at which the monocular tests were made. Then plus and minus lenses of low denomination are placed before the eyes, gradually increasing the strength of the lenses until the indicia are no longer readable. These limits are recorded, and correction for distance made as in the monocular tests.

It has been noted repeatedly that the monocular and binocular end points are not necessarily identical, even in cases in which the monocular regional accommodative amplitude is equal in the two eyes. In many instances the binocular positive element is only half that of the monoc-

ular, while the negative element is the same for both monocular and binocular tests. No cases have been observed in which the binocular positive element exceeded the monocular. In cases in which the binocular was appreciably less than the monocular positive element, the convergence maximum was insufficient. However, some patients with a definite convergence insufficiency manifested equal or nearly equal readings of the positive element, both on monocular and binocular tests. They generally manifested good accommodative function or even an excess.

It is perhaps too elementary to point out that the spherical addition for near vision in presbyopia requires more consideration than merely increasing the correction over the distance determination by some convenient rule of a definite amount of sphere for each year after average presbyopic onset. The indiscriminate addition of equal amounts to each eye routinely, is likewise only an estimate and not a measure of correction. The near correction should satisfy equality regarding the near point of accommodation, the far point, and the range and region in each eye as nearly as possible.

CONVERGENCE

The patient's position is maintained and both eyes are now tested simultaneously, the small card carriers being moved to the far end of the scale or removed entirely.

The middle scale is adjusted so that the first marking on the scale, which is 5, is 5 centimeters from the anterior surface of the cornea.

Maximum Convergence

This phase of the subject has been covered in the earlier paper referred to at the beginning. In it a chart is published which simplifies the use of the instrument.

Reserve Convergence

Noting the amount of maximum convergence and the amount of convergence in use at the patient's usual work distance, the amount of *reserve convergence* is represented by the difference between the two readings. If the amount of convergence in constant use approaches too closely the maximum convergence, there will necessarily be a low reserve, and

CHART 1

CONVERSION OF PRISM-DUCTION POWER INTO
METER-ANGLE VALUES

Δ	M.A.	Δ	M.A.	Δ	M.A.
4	1.24	16	4.97	28	8.72
5	1.54	17	5.06	29	9.03
6	1.87	18	5.6	30	9.33
7	2.18	19	5.89		
8	2.46	20	6.21		
9	2.79	21	6.54		
10	3.12	22	6.85		
11	3.42	23	7.15		
12	3.70	24	7.46		
13	4.05	25	7.78		
14	4.36	26	8.07		
15	4.66	27	8.58		

consequent symptoms of discomfort, or limited ability to perform close work with comfort. At least 6 meter angles of reserve should obtain.

Amplitude of Convergence

A chart is appended, in which prism-duction power, determined in the usual way, is converted into meter-angle values. In this way the maximum amount of relaxation of convergence added to the divergence in meter angles, expresses the patient's amplitude of convergence.

Indication is given as to the proper correction which will provide a sufficient reserve and insure comfort to the patient at the work distance.

By these tests the presence of convergent insufficiency or excess is evident.

These tests are performed without the correction to determine the patient's muscular ability, and then with correction to

determine satisfaction of the patient's requirements.

Alternate fixation or suppression is also brought out in the performance of these tests.

COMPARISON OF THE ACCOMMODATIVE AND THE CONVERGENT FUNCTIONS

With the various phases of accommodation expressed in diopters, and convergence expressed in meter-angle terms, the following comparisons can be made:

- Comparison of maximum accommodation and convergence
- Comparison of accommodation and convergence at any near point or usual work distance
- Comparison of reserve accommodation and convergence, maximally, at usual work distance, or any specified near point, which will assist in defining accommodative convergence insufficiency or excess.

In these tests the convergence is kept constant while the accommodation is being determined, and the accommodation is a known quantity while the unknown convergence is being determined. In other words, all other conditions are maintained at a constant while one single function is being determined.

COMMENT

In routine refractions the measurement of phoria and duction is commonly done, although the status of accommodation and convergence, maximal, relative and associated, for near-work distance is for the most part, neglected. The latter functions cannot be surmised from the phoria and duction determinations. Without an adaptable means such as this instrument affords, these tests are necessarily time consuming, fatiguing, and not correlated.

It is a simple matter to include the usual prism appliances for near-duction

as well as for phoria examinations.

Much has been written of the change occurring in the phoria status when the direction of gaze is directed elsewhere than directly ahead with visual axes parallel. Nothing has been recorded in the literature of the effect of accommodation and convergence under these conditions.

This instrument is adaptable for such measurements by tilting the beam vertically, by rotating the chin rest laterally, and readjusting the rails in relation to the changed position of the head.

In cases of accommodative convergence insufficiency the latent period of accommodative action is definitely slowed down, as is seen when testing the positive relative accommodation for near.

In alternating-suppression cases the relative accommodation is generally greater for the fixating eye.

Symptomology is not always proportionate to the existing error. The matter of the reserves offers the best solution.

Patients with a high exophoria, but with a good near point of convergence, tolerate plus corrections well, since the position of rest only is faulty, and normal convergence power is present, although it may be latent. These may be designated as cases of functional accommodative convergence insufficiency.

In duction insufficiency there is generally an accommodative spasm.

In convergence insufficiency there is usually a remote near point of accommodation.

In general, the greater the esophoria,

the greater is the positive relative accommodation; which explains why some patients tolerate a definite imbalance with few symptoms. They usually have a sufficient reserve of accommodation to satisfy overconvergence.

In general, the greater the exophoria, the less is the positive relative accommodation.

As a definitely high exophoria for near becomes less, the convergence near point becomes nearer in young patients.

Spasm of accommodation is often due to the excess convergence impulse necessary to overcome the exophoria.

Accommodative spasm in hyperopic subjects is usually an accommodative convergence excess. The counterpart is observed in patients with so-called relative hyperopia, who acquire strong convergence tendencies when they try to correct the hyperopia by strong accommodation.

CONCLUSION

Inasmuch as a large number of cases of heterophoria are cured or greatly improved by correcting the refraction alone, greater precision in prescribing refractive corrections should be observed, not only in consideration of the positions of rest and ductions, but also with due regard to accommodation and convergence in their various phases, and their respective balance relationships; especially if a definite disproportion of accommodation and convergence exists.

231 West Wisconsin Avenue.

THE REACTION AND BUFFER ACTIVITY OF NORMAL OX LENSES*

P. W. SALIT, PH.D.

Iowa City, Iowa

The determination of the reaction or hydrogen-ion concentration of biological tissues, such as the crystalline lens, is much more difficult than that of fluids. For this reason comparatively little work has been done on the lens. There are many methods for the determination of hydrogen-ion concentration, but only one is fundamental, and against this all other methods are standardized. In this method, commonly known as the hydrogen-electrode method, a platinum foil, coated with platinum black, in the presence of a continuous stream of hydrogen serves as a hydrogen electrode; the other electrode is a calomel cell, consisting of mercury in equilibrium with a paste of mercurous chloride and mercury; the electrolyte is potassium-chloride solution saturated with mercurous chloride. This method, as ordinarily employed, requires 10 c.c. or more of the fluid that is to be tested. It is apparent that the lens, in its original condition—that is, undiluted with water—cannot be used in this method. If, however, the chemical make-up of the lens is such that it can act as a strong buffer, a moderate dilution with distilled water will have practically no effect on its hydrogen-ion concentration. And if, in addition, the lens contains no free carbon dioxide, the pH can be accurately determined on the aqueous lens emulsion by the use of the hydrogen electrode. Sharp and Powell,¹ using the hydrogen electrode, determined the pH of egg white and yolk, both in their original or undiluted condition and also diluted with various amounts of distilled water. They found the pH of undiluted egg white and yolk to be 7.82 and 5.93, respectively; after adding 12 c.c. of

water to each, they were 7.89 and 5.94. When 14 c.c. of water was added to fresh samples from another egg, the respective pH readings were 7.92 and 5.96, and after adding 200 c.c. of water to each, the pH values were 7.93 and 6.23. Evidently the contents of the egg in their natural fresh condition possess remarkable buffer properties; especially is this true with respect to egg white, a dilution from 14 c.c. to 200 c.c. producing practically no change in pH. Since the lens substance, in its physical appearance, resembles that of egg white, it was thought that it might possess similar buffer properties and thus lend itself to the study of its reaction by the hydrogen-electrode method.

In this study the lenses of one-month-old calves and two-year-old cattle were used. Each lens was macerated in a mortar to a homogeneous paste, emulsified in distilled water, and diluted to either 15, 40, or 80 c.c. The emulsion was then transferred to a glass vial just large enough in diameter to contain the two electrodes of the apparatus. A few drops of amyl alcohol were added to prevent foaming on passing a stream of hydrogen through the emulsion.

The pH determinations were carried out on four calf lenses within half an hour after the death of the animals. Each lens was emulsified in 15 c.c. of distilled water, and the hydrogen-ion concentration was determined on this emulsion. Their pH values were found to be 7.55, 7.50, 7.70, and 7.50. Two calf lenses were exposed to the laboratory atmosphere for eight hours, then treated as those just described; their pH values were found to be 7.45 and 7.50, indicating practically no change in reaction. One calf lens that was

* From the Department of Ophthalmology, College of Medicine, State University of Iowa.

emulsified in 40 c.c. of distilled water and tested within one-half hour after death of the animal had a pH of 7.60. The second lens of the same animal was emulsified in 80 c.c. of distilled water, and its pH likewise was 7.60. Ten lenses obtained from two-year-old cattle were emulsified in 15 c.c. of distilled water within two hours after death of the animals. Their pH values were as follows: 7.45, 7.45, 7.45, 7.45, 7.40, 7.50, 7.39, 7.34, 7.37, 7.32, an

7.56 to 7.60. The same difference was shown when there was an increase in dilution from 15 to 80 c.c. When the lenses were exposed to air for eight hours and the pH determinations were carried out on 15-c.c. dilutions, the reaction shifted toward the acid side by only 0.08; that is, from a pH of 7.56 to 7.48, this change evidently being due to slight autolysis of the lens protein. Similar changes were observed in the lenses of two-year-old cat-

TABLE 1
MINIMUM, MAXIMUM, AND AVERAGE pH VALUES OF FRESH AND STALE LENSES

Age of Animal	"Fresh" lenses ($\frac{1}{2}$ to 2 hours after death)			Stale lenses (exposed to air for 8 hours)
	15-c.c. dilution	40-c.c. dilution	80-c.c. dilution	15-c.c. dilution
1 month Averages	pH 7.50-7.70 7.56 (4)*	pH 7.60 7.60 (1)	pH 7.60 7.60 (1)	pH 7.45, 7.50 7.48 (2)
2 years Averages	7.32-7.50 7.43 (10)	7.50, 7.50 7.50 (2)	7.60, 7.60 7.60 (2)	7.40, 7.40 7.40 (2)

* Figures in parentheses indicate the number of lenses studied.

average pH of 7.43. Two lenses from cattle of the same age were exposed to the laboratory atmosphere for eight hours, then emulsified in 15 c.c. of distilled water; each had a pH of 7.40. Two fresh lenses from two-year-old cattle, removed from the eyes within one to two hours after death, were emulsified in 40 c.c. of distilled water; each had a pH of 7.50. Each of two similar lenses that were emulsified in 80 c.c. of distilled water, had a pH of 7.60 (table 1).

It appears from the foregoing data that the lens tissue of calves is slightly more alkaline than that of two-year-old cattle, their respective pH averages being 7.56 and 7.43. The buffer activity of the calf lens is such that an increase in dilution from 15 to 40 c.c. for a single lens produces on the average an increase of only 0.04; that is, an increase from a pH of

7.56 to 7.60. A change in dilution of the lens from 15 c.c. to 40 c.c. resulted in an average increase in pH of only 0.07 (from 7.43 to 7.50), and a dilution to 80 c.c. resulted in an average increase of 0.17 (from 7.43 to 7.60). On the other hand, there was a slight decrease in pH, amounting to 0.03, when the determinations were carried out after the lenses were exposed to the laboratory atmosphere for eight hours; that is, a decrease from a pH of 7.43 to 7.40.

On the basis of the foregoing results it is apparent that practically no change in pH of the normal ox lens occurs with emulsification in 15 c.c. of distilled water. Therefore the electrometric method with the hydrogen electrode is applicable in pH studies of normal lenses that approximate the size of calf lenses, provided there is no appreciable amount of free carbon dioxide. So far, according to my knowledge,

there are no direct experimental data showing whether the normal lens does or does not contain free carbon dioxide. Sauermann² in his pH studies of normal cattle lenses used the Michaelis³ colorimetric method in which precautions were taken to prevent the escape of carbon dioxide. He reports the following pH values: 7.4 for 40 lenses, 7.5 for 7 lenses, and 7.6 for 3 lenses, an average pH of 7.43. This is in exact agreement with the average value obtained in the present work on two-year-old cattle. And although Sauermann fails to state the age of the animals from which he obtained the eyes, it is safe to assume that the latter came from animals of approximately the same age—that is, two years old—for this age greatly predominates in cattle used in abattoirs. It is therefore evident that there is no free carbon dioxide in normal ox lenses.

SUMMARY

The hydrogen-ion concentration and the buffer activity of normal calf and two-year-old cattle lenses were studied electrometrically, using the hydrogen electrode and a saturated calomel cell. In this study it was found that if a single lens is emulsified in 15 c.c. of distilled water, the dilution, on account of the high buffer property of the lens substance, produces practically no change in the hydrogen-ion concentration. The average pH of calf lenses is 7.56 and that of two-year-old cattle is 7.43. The latter figure is in exact agreement with the pH value found by Sauermann for normal cattle lenses by the Michaelis colorimetric method in which precautions were taken to prevent the loss of carbon dioxide. It is therefore concluded that normal cattle lenses contain no free carbon dioxide.

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THE DISLODGING FORCE UTILIZED IN INTRACAPSULAR CATARACT EXTRACTION

T. J. DIMITRY, M.D.
New Orleans, Louisiana

It has long been a wonder to me that so few¹ of those gifted in argumentative writings have come forward and expressed themselves regarding the force that is required to remove the lens in capsule from the eye. A knowledge of its application is basic, and the very success of an ideal procedure depends upon knowing just how this force should be directed. I have labored under the impression that its application has been misunderstood, else the giants of learning would have written more instructively as regards their special techniques, so as to rescue those committing error and better qualify ambitious novices. On many occasions, I have analyzed the adroitness of successful surgeons while they delivered the force, and have remembered fundamental teachings regarding the lens attachments and surroundings to conclude that the surgeons did not break the bonds of the lens by pulling on either the lens or its capsule. It is my conviction, after witnessing many operate and after great personal experience, that no matter what intracapsular procedure is adopted the lens is not extracted by the use of force applied as traction.

Unless it becomes fully known "that the lens is not pulled from the patellar fossa," the young surgeon cannot hope to succeed, nor can general acceptance be expected for the intracapsular procedure. The statement is so ostensibly correct that it should pyramid writings on the cataract operation.

Although the capsule of the lens is grasped with forceps in the most popular of techniques, and movements of the hand reveal a pull and zigzagging of the lens from the eye, but little trust should be put

in this particular finesse. Watch the other hand rupturing the zonules by making pressure with a rod or spoon. It is not the force that appears as actual to eye and mind that accomplishes the removal of the lens, but the inapparent push exerted by the rod wedging the lens from the vitreous. You may ask, therefore, why forceps and vacuum discs are used to grasp the capsule, when the capsule is frequently torn in using these instruments; or, what purpose they serve since they do not break the lens from its moorings. Colonel Smith answers that they are unnecessary, "a push applied to the tip of the lens through the cornea is alone essential."

J. Russell Smith¹ witnessed Barraquer using a vacuum disc, "in which the lens was seized and drawn out of the eye in its capsule," without deforming pressure having been applied to the outer wall of the globe. But, upon studying slow moving pictures, it became clear to him that "Barraquer's success could not have been achieved by pulling," for "he dislocates the lens by pushing it bodily back into the vitreous, a course which would impose no strain on the grip of the instrument which it was not fit to stand." He adds that the secret of success depends on "pushing instead of pulling."

Procedures, such as "the combined forceps and expression techniques" of Stan-culeanu, Knapp, Török, Lancaster, and Davis, diminished the "brute force" of Smith. Colonel Smith did not grasp the lens capsule with instruments but applied a hook at the limbus to the lens periphery, making pressure with it to break the attachments between the lens and ciliary processes, using the vitreous for a cush-

ion. The other surgeons directed the force as did Smith, but while doing so passively held the lens capsule so as to have the force transmitted between the lens and vitreous.

Davis says, "... in no way is the force of the combined procedure" (in which the capsule is grasped with forceps and pressure delivered) "comparable to the force formerly exerted in the Smith operation." He further states that the pressure used in the combined techniques "is 95 percent push and but 5 percent pull" yet the push is gentle in that it is directed between lens and vitreous.

A knowledge of this procedure has brought great success to many adopting the intracapsular method, and the want of such information has resulted in failure for others.

It is my surmise, that Smith's superior dexterity lies in manipulating the hook to get behind the lens, although he did not convey this information in his writings, and Barraquer's success definitely did not depend upon a pull, although he used a vacuum grasper. Those using the combined procedure wedge the lens from the vitreous, but do not pull it from its attachments. Barraquer, after rupturing zonules by a push instead of a pull, topples the lens sidewise to direct it out of the eye.

I have adopted and for some time utilized a net for removing the lens in capsule, in fact a zonulatome⁷ that encircles the lens and presses around it, causing the lens to swell up and become ensnared in cross wires. The lens is grasped bodily; but even so the instrument is not used to pull it out. The zonulatome directs the lens after the zonules have been ruptured. I have also developed another instrument. It is very much like Barraquer's grasper, but makes intermittent suction on the capsule, breaking the zonules.⁸ It requires no force, neither pull nor push, to get the lens in capsule from the eye.

Having accounted for the success of the procedures, it becomes necessary to explain why a push on the lens is better than a pull. To do this, I have made models of the eye for demonstrating the different procedures and for creating slow moving pictures. Cords and rubber tubes were used to develop action. The lens, in the fossa of the vitreous, is seen to be fenced by the scleral spur, against which it becomes jammed if direct pull is made. The model with cornea and iris removed, reveals that the lens cannot be made to slide over the scleral fence. It might be caused to mount the fence after the distal side of the lens has first been pushed down into the vitreous; otherwise it is brought over by toppling. If the wedge is inserted between the lens and the vitreous on the distal side, the proximal side acts as a hinge. A revolution of 180 degrees is produced at the hinge when the force follows the lens outward. The scleral spur, which I have designated a fence, is the all-important point in applying pressure. If the force is applied behind the ridge it must accomplish its effect by distorting the vitreous, whereas, if applied in front of the ridge, the force is delivered between the lens and vitreous.

To what extent the applied force may affect the stability of the vitreous should always be kept in mind. Fortunately nature in her wisdom designed a semisolid vitreous inclosed within the scleral envelope the aperture of which is smaller than the diameter of the sphere; hence the normal vitreous must be fractured before it can get out of the eye. If the vitreous has become liquid, the opening made for the extraction of the lens is sufficient to spill it from the eye, for the spherical shape of the eye is changed by the incision into the globe. When the vitreous is liquid it will spill, for a sphere has a greater capacity than any other form of container.

It would be almost impossible to meas-

ure the sustaining strength or the degree of force required to produce fracture of the vitreous, particularly when the normal vitreous and eye are considered. The force applied by Stanculeanu, Knapp, Török, Lancaster, Davis, and others in their respective operations is much greater than they acknowledge. Pressure properly directed is a prerequisite for success. As soon as the zonules rupture, and the probe reaches behind the lens, there is no longer pressure on the vitreous but away from the vitreous to the back of the lens, and slowly the remaining attachments are broken as the instrument follows the lens out of the eye.

The vitreous as a mass maintains itself better against a pushing than against a pulling force. When pushed upon, the

vitreous resists like an elastic body; when pulled upon, its surface tension is weakened, lessening a force that provides greatly for its integrity.

Unless it is known that the lens should not be pulled from the eye in the course of performing the intracapsular cataract extraction, eyes will be lost and the procedure ultimately abandoned. I am convinced that many do not know the importance of this statement. The maneuver used for dislodging the lens should be thoroughly understood by every ophthalmic surgeon. With this in mind, given the deftness of hand required for the intracapsular procedure, there is no reason why the many may not obtain the skill of the few.

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NOTES, CASES, INSTRUMENTS

A NEW ORBITAL IMPLANT

WILLIAM BROWN DOHERTY, M.D.

New York

The tolerance of the orbital tissues to foreign materials is well known, and for this reason many substances have been implanted in Tenon's capsule in order to obliterate unnatural folds and depressions in the upper and lower lids. Implants also prevent ptosis, impaired motility, and sinking of the artificial eye. My¹ special interest in this subject developed during the World War, but it is not my intention in this article to discuss the merits of the numerous implants. I wish, however, to call attention to a new implant constructed of an alloy called vitallium; a product of the Austenal Laboratories of New York City.

As metallurgical knowledge² increases, particular alloys are developed for specific fields, and in their applications exhibit advantages of superior properties not obtainable in the constituent metals of which they are composed. Vitallium is a casting alloy, 90 percent of which is composed of cobalt and chromium with a smaller percentage of molybdenum, and is designated as a cobalt-chromium alloy. The alloy is exceptionally strong and hard, very light, and has been found³ to be completely inert and most compatible with living tissue, producing no tissue nor electrolytic⁴ reaction. This has been shown in a series of very interesting experimental studies. Vitallium has a specific gravity of 8.29,—much less than the specific gravity of pure gold, which

is 19.3, or of casting golds, which range from 14.0 to 18.0. This material resists strong mineral acids, and a solution of sodium chloride of any degree of concentration over any period of time produces no effect on it. Vitallium has been used for a considerable time in prosthetic dentistry, and now plates and pins⁵ have



Fig. 1 (Doherty). Vitallium orbital implant.

been most successfully used in the treatment of fractures.⁶ The idea occurred to me that such a material is suitable for orbital implantation, and I presented the first model before the New York Ophthalmological Society during the April, 1938, meeting.

I wish to extend my appreciation and thanks to the Austenal Laboratories of New York for their kind assistance; and to E. B. Meyrowitz of New York for the excellent photograph.

150 West Fifty-fifth Street.

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REPORT OF TWO CASES OF UNILATERAL RETINITIS PIGMENTOSA*

S. A. AGATSTON, M.D.
New York

The occurrence of bonafide cases of unilateral retinitis pigmentosa again stirs up the controversy of etiology.

In spite of the fact that numerous theories have been promulgated regarding the pathogenesis of retinitis pigmentosa, no single author has been able to offer an unassailable explanation. The abiotrophic theory is supported by the occurrence of cerebral involvement in atypical cases of tapeto-retinal degeneration but does not go well with unilateral occurrence. The suggestion of traumatic origin of the disease, promoted by Wagenmann's¹ experiments, is not consistent with the statistics, which show that retinitis pigmentosa following trauma is practically unknown. The angiospastic theory is surely unsatisfactory, because it is difficult to conceive the occurrence of arteriolar spasm at an early age and limited to retinal vessels. Also, if this were true, retinitis pigmentosa should be a common occurrence in essential and malignant hypertension, which it is not. Neither does it occur in secondary atrophies associated with optic neuritis, retrobulbar neuritis, or toxic amblyopia. Certain it is that in all typical cases there is gradual occlusion. So constant is this vessel change that without it diagnosis is

impossible. Moreover, so characteristic is the appearance of the disc and vessels, that, in the absence of malignant hypertension, the disease may be recognized before the periphery or pigment spots are seen. The pigment appearance so constantly observed in retinitis pigmentosa is also seen in other diseases, such as retinosis, choroidosis, choroideremia, choriorretinitis, topical senile degeneration of the peripheral retina. The arterial picture, however, belongs to retinitis pigmentosa.

It is not likely that the retinal vessels are narrow because of general atrophy of the retina of which they are really not a part. In diffuse chorioretinitis where practically the whole retina is destroyed, the retinal arteries are usually normal.

It seems to me that if we could find an explanation for the gradual narrowing of the vessels, we would hit upon a workable theory applicable to the etiological solution. We know now that narrowing of vessels with fibrotic and hyperplastic changes is caused by any form of occlusion. Whether that occlusion is produced by an embolus, thrombus, pressure, or spasm makes very little difference. Hence, the vessels found in retinitis pigmentosa resemble those in malignant hypertension, or following intra- or retrobulbar neuritis. In other words, the vessel changes are not secondary to general atrophy but secondary to pressure and occlusion.

We can conceive the occurrence of a topical neurofibromatous formation. Such formation may be limited to the central portion of the optic nerve or may be found elsewhere in the nervous system. This would explain the cerebral cases and

* Presented at the New York Academy of Medicine, Section on Ophthalmology, April 18, 1938.

possible association with otosclerosis. In explanation of this hyperplasia one might draw a parallel with what happens in Von Recklinghausen's disease. Wagenmann's experiments also should not be disregarded. He showed that cutting off the vessels behind the globe in rabbits resulted in pigmentary degeneration. Trauma to the eye could not result in pigmentary degeneration unless by scar tissue; the retinal vessels were compressed. My own experiments on rabbits, consisting of injection of alcohol into the optic-nerve trunk of the rabbit, gave results similar to Wagenmann's.

It appears that sudden blocking of the retinal artery does not produce pigmentary degeneration, but very gradual occlusion occurring early in life (retinitis pigmentosa has its onset between the ages of three and eight years, according to Hoering² and others) causes a gradual degeneration of the periphery with replacement of necrotic spots by proliferating pigment epithelium. This happens because the terminal small arterial branches become fibrotic, and early in the disease lose their patency.

Shoemaker,³ in his monograph, shows a massive hyperplasia within the optic nerve, as a post-mortem finding. In our pathological laboratory at Montefiore Hospital, Dr. Smoleroff and I have been able to demonstrate similar changes. The occurrence of unilateral retinitis pigmen-

tosa, of which there should be no doubt, while it militates against other theories, does not conflict with the theory of intraneural hyperplasia.

Dr. M. N. Beigelman⁴ gives a résumé of 11 cases of unilateral retinitis pigmentosa reported since 1865. In that year the first case was reported by Pedraglia.⁵ The oldest patient was 42 years of age and the youngest 10 years of age.

Case 1. M. W., aged 53 years, complained of poor vision of the right eye for at least 38 years. The right eye showed retinitis pigmentosa with posterior cortical cataract and optic atrophy. Vision O.D. was ability to see hand movements on the temporal side only. The fields of vision of the right eye could not be taken with the largest test object. The left eye was normal with 20/25 vision and a full field. Laboratory tests were negative except for a positive sputum for tuberculosis.

Case 2. Mrs. S. H., aged 45 years, noticed poor vision in the left eye at the age of 14 years. This eye showed a posterior cortical cataract and typical retinitis pigmentosa with sclerosis of choroidal vessels; very thin retinal arteries and "apple sauce" color pallor of disc. Vision was light perception in the temporal field. The right eye was entirely normal as was also the general health.

56 East Eighty-ninth Street.

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THE RESULTS OF SQUINT OPERATIONS: A REVIEW OF THE LAST 286 CASES AT THE UNIVERSITY OF OREGON CLINIC*

FREDERICK A. KIEHLE, M.D., AND
G. H. HENTON, M.D.
Portland, Oregon

The review of this series of squint operations performed during the last 10 years in connection with the clinic of the University of Oregon Medical School represents results obtained by a great variety of operators of varying degrees of surgical ability and experience, using various operative procedures. It can thus probably be considered a fair cross section of operative results in muscle surgery the world over. In other words, any deductions possible, apart from such as might suggest improved procedures in our own clinic, are exceedingly general and probably applicable to squint operations everywhere.

The esotropia cases outnumbered those of exotropia nearly eight to one, being 244 as against 31. There were eight cases with vertical phoria. The patients, nearly all children, averaged 10.9 years in age. The proportion of strabismic children to children-clinic-attendance was about 1 in 42. The figures cover only the last 10 years and deal only with nonparalytic cases. The university clinic has been operating since 1931; the Doernbecher Memorial Hospital for Children, connected with the university, was opened in 1926.

These operations were performed by 12 operators, all practicing ophthalmologists, save for a few done by the resident in

ophthalmology, whose qualifications require that he shall have had at least one year of special training before appointment. All major surgery is performed under the supervision and in the presence of the senior clinician in charge.

All types of operations were employed. The total number of so-called "weakening" operations was 214 (170 partial tenotomies, 44 recessions). A total of 250 shortening operations included 43 advancements of various types, 56 resections, 38 tuckings, and 113 cinch operations. Surgery was usually limited to a single eye; in only eight cases were bilateral tenotomies or cinch operations performed. In 17 cases one eye was treated at the first operation and the second eye at a subsequent time. In 186 cases two or more muscles were attacked, while in 92 only a single muscle. Two hundred thirteen individuals were operated on by a single operation; 18 had two operations; two individuals were operated on three times; one, four times; and one, five times.

The average amount of esotropia prior to operation was 27 degrees. By a strange coincidence the same amount (27 degrees) of exotropia also was found. And following operation 13 degrees of esotropia and 14 degrees of exotropia persisted.

One postoperative death occurred. The only other catastrophe in the series involved a patient with an abnormally thin and nonresistant sclera which was cut through at the point of a tenotomy. A uveitis followed and the vision is at present reduced to 10/200.

A comparison of the results obtained by various operators shows surprisingly little variation. An operation by a resident of comparatively little experience produced occasionally a remarkably good result, due partly to good fortune and

* From the Department of Ophthalmology, University of Oregon Medical School. Read at the meeting of the Pacific Coast Oto-Ophthalmological Society, June, 1938, at Victoria, British Columbia.

partly to good supervision.

If any deductions are justifiable from the entire study they are these: that no single operative procedure can be relied upon to produce perfect results in all cases; that dexterity in carrying out any technique is the great desideratum; that the average operator will do well after careful study of his cases to limit himself to a single or at least to a comparatively few types of operation and to perfect himself in these types rather than spread himself out thin by trying one type of operation after another, experimenting with every new procedure suggested; and finally that with experience there develops a surgical judgment and intuition that cannot be expressed in words nor in terms of advice.

515 Medical Arts Building.

STANDARDIZATION OF THE PREPARATION OF EYE DROPS

W. T. HASLER, JR., M.D.
Everett, Washington

It will be undertaken in this paper to form a definite plan, based on scientific research, of presenting a solution for a most neglected problem in the field of ophthalmology; namely, that of standardizing the preparation of eye drops.

It will be observed in visiting hospitals, ophthalmologists' offices, and drug stores, that the preparation and changing of eye drops to fresh solutions is deplorably neglected. One has only to notice the dates of expiration to learn that in many cases a change is long past due or there are no dates at all. Most hospitals, however, apply an expiration date, but this is not the rule in private practice, nor do the majority of druggists apply the expiration-date method in dispensing eye drops to patients. Upon holding these bottles to

the light, all variations of floating sediment can be seen, and when cultured a bizarre number of bacteria, yeasts, molds, and fungi can be grown. These are pathogenic and nonpathogenic.¹ Nonpathogenic bacteria alter the constituents of the solutions considerably; for example, Sabalitschka reports the reduction of a solution of calcium chlorate to a chloride within 12 months,^{2, 3} and potassium chlorate to a chloride in one week.⁴ This did not occur with the addition of a proper preservative. Alkaloids are also altered in their effectiveness according to Tagliavini.⁵ He observed that ampoules of scopolamine and opium become ineffective because, due to improper sterilization, molds had destroyed the alkaloids.

The question can now be stated. Should we not attempt a standardization process whereby, at least in the literature, a simple method for eye-drop preparation can be obtained? Those of us using and dispensing these solutions should insist upon their correct preparation in this standard way; and it will be shown that sterility can be maintained, deterioration lessened, expense reduced, physiological properties instituted, and danger from infection lessened.

Eye solutions are contaminated after being used once or twice, and after two or three days, when cultured on agar plates for 10 to 12 hours, yield many and varied types of bacteria.⁶ This occurs from touching the dropper to the eyelids or from dust particles falling into the solution. The eye solutions usually contain no preservative nor germicidal agent to maintain sterility and there is, therefore, always danger of the transfer and introduction of infection to the eye, particularly pre- and postoperatively.

The germicide and preservative widely used in Europe for sterilization of eye solutions is the Nipagin-Nipasol combina-

tion. These substances are the ester derivatives of benzoic acid: p-oxybenzoic acid-methyl, ester (Nipagin-m); p-oxybenzoic acid-propyl, ester (Nipasol-m). These are organic chemicals which have the aforementioned necessary qualifications and in addition are tasteless, odorless, easily soluble in lipoids and boiling water.⁷ They do not affect the reaction, smell, taste, color, or consistency of the materials with which they are to be used. They are also unaffected by dilute acids and bases, but are affected by strong bases when boiled for a long time. They are fine, white, crystal powders, and will last indefinitely, even in a dissolved state, without impaired efficiency. They also dissolve with a neutral reaction; therefore, they do not affect the pH of the solution.

Nipagin-Nipasol is nonpoisonous and nontoxic to man when used in even larger amounts than are to be used here. They are harmless when used as preservatives for foods and pharmaceutical preparations, and two to four times less harmful than phenol, and without cumulative effects.⁸ These esters were tried on guinea pigs, dogs, and cats before being given to human subjects. From the results obtained with animals, the toxic and lethal doses were computed for humans.

	<i>Toxic</i>	<i>Lethal</i>
Nipagin-m	150 gr.	225 gr.
Nipasol-m	225 gr.	450 gr.

The small amounts suggested in this article for the preservation of eye drops would, therefore, be entirely harmless, and are adequate for preserving and disinfecting the solutions.⁹

These two esters, Nipagin and Nipasol, when combined were found to be the most effective preservatives and germicides of all the benzoic acid esters.² This combination in a 1-percent solution, as found by the author, reacts to kill a mixture of *B. coli* and *Staphylococcus pyo-*

genes aureus within two hours. It was further found that 0.05-percent Nipagin-m plus 0.05-percent Nipasol-m in solution killed these organisms within six days. This also was true when applied to common molds, yeasts, fungi, gram-positive and gram-negative bacilli. Since turbidity is observed in many stock buffer solutions, it has been traced to the growth of a species of *Torula*, which are also killed. Leschke found that a 0.06-percent propyl ester solution (Nipasol-m) would guarantee lasting sterility.¹⁰ As to resistant spores, Eschenbrenner found it possible to kill them with a 0.1-percent Nipagin-Nipasol solution in 15 minutes by boiling at 100°C., while, without using this ester combination, it took four hours to effect the same result.¹¹ Sabalitschka and Böhm compared Nipasol, Phenol, and Tricresol as to their germicidal effects, and found that *Staphylococcus pyogenes aureus*, *B. coli*, and Para-typhoid B., in nutrient agar, were killed in one day with the addition of 0.056-percent solution of Nipasol, while it took a 0.3-percent solution of phenol, and a 0.1-percent solution of Tricresol to do the same.¹²

In reviewing other papers, much evidence was found concerning the germicidal and preservative quality of these esters, with information on various organisms—anaerobes, aerobes, spores, fungi, yeasts, and molds—and in each the organisms were killed with Nipagin-Nipasol combination.^{3, 12, 7, 13}

The recommended dilution for the sterilization of eye solutions is a combination of 65 parts Nipagin-m plus 35 parts Nipasol-m.^{14, 15} This low concentration is sufficient to prevent the growth of new organisms and to take care of those already present; yet to the patient it is nontoxic and nonirritating. It is chemically neutral to the eye solution. One cannot expect to have immediate germicidal effect with this

low concentration; however, it will kill *Staphylococcus aureus* in 24 hours, and will prevent the growth of fungi.

Recently chlorobutinal in a 0.5-percent solution has been recommended for sterilization and preservation of eye solutions. It is doubtful that this will prove useful, not because it may not be a good preservative, but because it stings the eye too severely. In comparison, an eye solution with a Nipagin-Nipazol preservative added gives a slight sting; with an acid buffer, this is less; and still less with an alkaline buffer. All solutions listed in the table, except the zinc salts, produce a mild sting at first; the zinc preparations a distinct smart, but all are followed by a most refreshing sensation in comparison to the effect of contaminated drops, the sting of which is great. This mild sting is not uncomfortable, and should offer no disadvantage. Most adults and children flinch whenever anything is done to the eyes. Chlorobutinal is precipitated from solutions with a pH above 7.5. It is also worth mentioning that the preparation of chlorobutinal is very time consuming to a busy pharmacist because it is difficultly soluble in an aqueous solution.

After selecting the best-known preservative and germicide with the requisite qualifications, which are sound in every respect to date, it is necessary to have all solutions as near alike in pH value to the tears themselves as possible before an eye solution can be called perfect. There must also be a proper buffer value for each eye solution from which the medicaments can best be absorbed. Alkaloids are best absorbed and when used are less irritating in a slightly alkaline solution with a pH of 7.6. This latter subject has been very admirably worked out by Dr. S. R. Gifford.¹⁶ By his permission, I am using some of his solutions (see table), others I am adding for a more complete list and

have compiled them in a simplified table. With this guide any physician or druggist can prepare or have prepared the most commonly used eye solutions. There will be no difficulty in having at all times perfectly noncontaminated eye solutions that will be safe for the treatment of patients in offices, hospitals, and homes.

PREPARATION OF STANDARD EYE DROPS

1. Dissolve by boiling one minute in 1,000 c.c. of double-distilled water, 0.8 gm. Nipagin-Nipazol combination. This makes an antiseptic and preservative water.
2. *To prepare acid buffer solution:*
Boric acid c.p. Gm. 12.4
Potassium chloride crystals c.p. Gm. 7.4
Dissolved in 1,000 c.c. of water as prepared in step no. 1.
3. *To prepare alkaline buffer solution:*
Anhydrous sodium carbonate c.p. Gm. 21.2
Dissolved in 1,000 c.c. of water as prepared in step no. 1.

The following table contains the proper proportions in which to use the buffer solutions to give the eye preparations their correct pH value. Any variation in the amount of the drug used in concentrations which might be used in the eye will not change the pH value. If the alkaline buffer solution is kept in a dropper bottle with a dropper giving 0.05 c.c. to each drop, the dispensing will be easier for the pharmacist.

Drug	Acid Buffer oz.	Alkaline Buffer c.c. or drops	pH Value
Butyn	1	—	5.0
Phenacaine . . .	1	—	5.0
Procaine	1	—	5.0
Cocaine	1	—	5.0
Ardenalin	1	—	5.0
Holocaine	1	—	5.0
Zinc salts	1	.05	6.0
Homatropine . .	1	1.50	7.6
Euphthalmine . .	1	1.50	7.6
Physostigmine .	1	1.50	7.6
Pilocarpine . . .	1	1.50	7.6
Scopolamine . .	1	1.50	7.6
Atropine	1	1.50	7.6
Sodium fluoresceine .	1	8.00	9.0

Shortly after the publication of Dr. Gifford's article on buffer solutions, an experiment was made in which all eye

solutions were prepared accordingly, but it was found a heavier growth of fungi developed more rapidly in the buffer solution than in plain distilled water, therefore, Nipagin-Nipazol seemed to be the only preparation possessing ideal qualities for preserving eye solutions. It is a fact, however, that the damp climate that we have in the northwestern part of the United States is more conducive to bacterial growth, particularly fungi. East of the Cascade Mountains, where a drier climate exists, the growth in such solutions is less; therefore, our problem in this climate is more difficult.

SUMMARY

After consideration of the work done upon this neglected problem of ophthalmology, the following summary is offered:

1. All eye drops when prepared for nonoperative use are contaminated, and bacteria grow profusely in these solutions.
2. In the damp climate of the northwestern part of the United States,

fungi grow profusely in alkaline and acid buffer solutions when prepared without a preservative.

3. Suitable and well-proved benzoic-acid esters are used with the ideal acid and alkaline buffer solutions to preserve eye solutions, kill introduced bacteria, prohibit growth of fungi, and maintain and practically guarantee sterility for long periods of time.
4. Benzoic-acid esters have reliable preservative and germicidal powers and are nontoxic to the human eye.
5. The cost of changing and throwing away contaminated solutions is greatly lessened.
6. A convenient table for standardization and preparation of eye solutions is given.
7. The mild sting in using these preparations is not objectionable.

Appreciation is extended to Mr. George A. Tozer, pharmaceutical chemist, for the preparation of solutions required in this work.

611 Medical and Dental Building.

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COUNTERBALANCED WALL BRACKET FOR SUSPENDING COMBERG SLITLAMP

GEORGE N. HOSFORD, M.D.
San Francisco

Although the slitlamp and corneal microscope have added enormously to our knowledge of pathological processes in the anterior segment of the eye, I have long been dissatisfied with the available means of applying this instrument to the

over the floor on large rubber-tired casters. I was warned by the agents of the manufacturers of this instrument that the vibration produced by rolling the instrument over the floor would be detrimental to the light source and to the delicate adjustments of the beam. While this may be true, I must say the instrument stood the experience remarkably well and when it was examined a few days ago by Mr. Victor M. E. Koch, vice-president and technical manager of Carl Zeiss, Inc.,

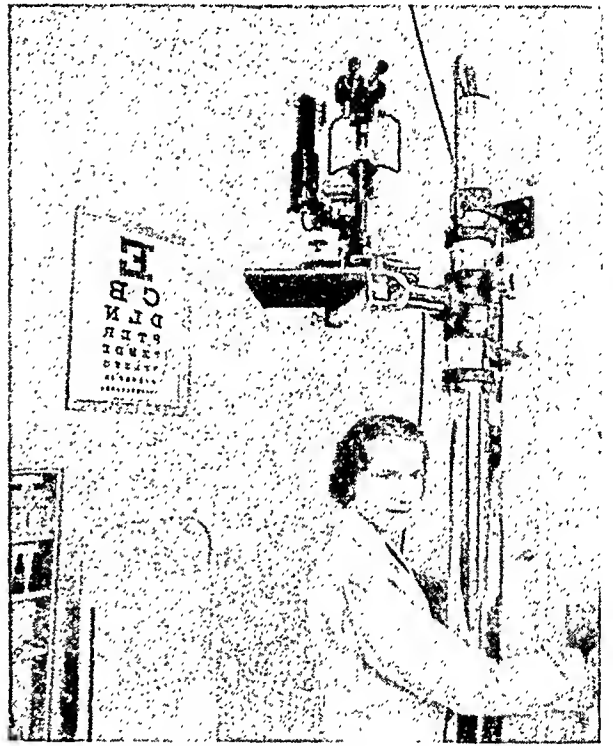
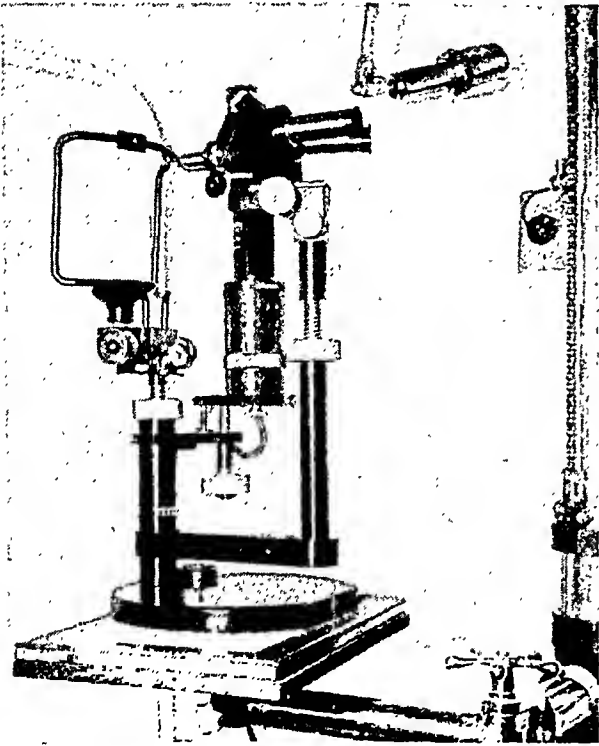


Fig. 1 (Hosford). Counterbalanced wall bracket for suspending Comberg slitlamp.

routine examination of patients. When the slitlamp is kept in a separate room to which it is necessary to move patients whose vision is impaired, to seat them on uncomfortable stools, where it is necessary to adjust the height of the instrument by slow-moving screws and to make many adjustments, the tendency is to omit the slitlamp examination of borderline or presumably normal patients. Some years ago, I insisted on mounting a Gullstrand (Zeiss) slitlamp on a table which rolled

he assured me that the instrument was in perfect condition. This model of the slitlamp is too large and requires too much room to mount in any other manner and still preserve the benefits of the beam as it was originally planned to be used.

With the advent of the Comberg model, however, we have available a more compact instrument which weighs approximately 50 pounds. In looking about for some means of suspending this from the wall, in such a manner that it could be

pushed out of the way when not in use and quickly swung into position before a patient in a treatment chair, it occurred to me that a Pacifix wall-mounted counterbalanced stand would easily solve this problem. I interested Mr. Alfred Abend, of the Pacific X-ray Sales Company, in the matter, and he built a special arm to attach to this stand. A flat metal table measuring $9\frac{3}{4}$ inches by 14 inches, with a felt-covered hardwood top, affords ample space upon which to place the base of the slitlamp and upon which the elbows of the observer may be rested. The stand is firmly bolted to a stout piece of wood 8 feet long, 8 inches wide, and $1\frac{1}{4}$ inches thick; this, in turn, is firmly fastened to the wall. The vertical part of the stand projects out from the wall only 10 inches. There is a range of vertical motion of over five feet, and if the stand is placed one foot from the floor, it is possible to

push the instrument above the height of the tallest patient when not in use. The instrument is counterbalanced so that it moves up and down with the greatest ease, aided by wide vertical bearing surfaces and the roller bearings. The arm is designed to support a weight of 350 pounds, so there is an ample factor of safety, and great stability is secured. Such a suspension has the effect of having the instrument on a universal joint, and it can be used with a facility comparable to that of the hand ophthalmoscope. The many types of hand slitlamps on the market bespeak a demand for a more usable instrument. With this suspension, however, the rather unsatisfactory hand types of slitlamp are rendered unnecessary and the range of usefulness of the Comberg slitlamp is greatly increased.

450 Sutter Building.

SOCIETY PROCEEDINGS

Edited by DR. H. ROMMEL HILDRETH

WASHINGTON, D.C., OPHTHALMOLOGICAL SOCIETY

March 7, 1938

DR. G. VICTOR SIMPSON, *presiding*

THE USE OF BENZEDRINE IN REFRACTION

DR. HUNTER MCGUIRE, of Winchester, Virginia, brought out the fact that he had, during the past year and a half, examined some 300 cases, using the more recent technique of Dr. Beach. This consists, in patients over the age of 12 or 14 years, in the instillation of one drop of 5-percent homatropine in each eye to be followed in two minutes by one drop of benzedrine sulphate. Possibly a more complete cycloplegia can be induced if another drop of benzedrine is instilled five minutes later. Dr. McGuire emphasized the fact that cycloplegia is complete in one hour and refraction must be done promptly, since the peak of paralysis of the accommodation is reached rapidly and passes rapidly. It was emphasized that among the advantages of this new type of cycloplegic are: (1) fewer drops to be instilled with less annoyance to the physician and to the patient; (2) cycloplegia quite as complete as that with the classical method; (3) rapid return of accommodation. The patient is usually able to read fine print in about 10 to 14 hours and is easily able to return to work in 18 hours.

In patients below the age of 12 or 14 years, 1-percent atropine sulphate is instilled in the office and then followed by one drop of 1-percent benzedrine and five minutes later another drop of 1-percent benzedrine. With atropine the refraction may be done in about an hour and a half. The additional advantages in

this type of cycloplegic over the classical method are: (1) the cycloplegic may be administered in the office and better controlled than in using the classical method; (2) the refraction may be largely done at the first visit as opposed to two or three visits by the classical method; (3) the return of accommodation occurs in four to six days, causing less loss of time in school.

Dr. McGuire emphasized the fact that in his experience the type and size of the refractive error is not a factor in ease of induction of cycloplegia nor in the length of time taken to recover accommodation. Pupillary dilation persists definitely longer than cycloplegia. The use of benzedrine sulphate has caused no rise in tension in any of his series of cases.

Discussion. Dr. Louis Greene summarized the findings in a series of 335 cases seen in private practice. Dr. Greene's technique and views differ with Dr. McGuire only in details. Dr. Greene had been accustomed to using 2½-percent homatropine and found it quite satisfactory. He found that all adult patients had sufficiently recovered accommodation at the end of eight or twelve hours to read comfortably.

Dr. William T. Davis believed that cycloplegia was probably more complete with this procedure than when using the classical procedure unless it were very scrupulously carried out.

Dr. McGuire, in answer to questions, stated that he had seen no toxic effect from the use of benzedrine or from the use of 5-percent homatropine, and that he had not used any miotic, either with the newer method of cycloplegia or with the classical method.

SYMPOSIUM ON THE USE OF SULFANIL-AMIDE IN EYE CONDITIONS

COL. F. H. THORNE gave a general discussion of sulfanilamide, briefly reviewing the history and listing the toxic symptoms and their treatment. He pointed out that he had found, after a not too thorough search, two cases in which sulfanilamide had been used for ocular pathology. Colonel Thorne himself reported a case of prostatitis under treatment in Walter Reed Hospital. The patient, prior to treatment, had 20/20 vision; 400 grains of sulfanilamide were given, and at that time the vision was reduced to 20/200 in each eye, though the eye was absolutely normal otherwise. The patient accepted a +3.50 D. sph. \approx +.50 D. cyl. ax. 180° to obtain 20/20 vision in each eye. The drug was withdrawn and in one week the patient had 20/20 vision and read Jaeger 1 without any correction at 13 inches. Colonel Thorne reports this case as one of spasm of the ciliary muscle induced by the use of sulfanilamide.

Discussion. Dr. Thomas Egan reported a case of gonorrheal iritis in an adult. The patient had a low-grade iritis and during the hunt for a focus of infection, a prostatic massage was performed. The patient immediately had an acute flare-up of the iritis, which was typically gonorrheal. No medication was given other than instillation of atropine and the use of hot applications, plus the taking of sulfanilamide by mouth. In 24 hours the improvement was marked and the patient was well within 10 days, having a vision of 20/15.

Dr. Ernest Shepherd reported a case of streptococcic abscess of the lid in a child three years old. The child ran a septic temperature but had negative blood culture. The infection pointed through the lid near the outer canthus and was incised and drained. The patient was given 140 grains of sulfanilamide,

small blood transfusion, and supportive treatment during the course of four or five days. The case ended with complete recovery other than the loss of skin over a large portion of the upper lid, which now is healing nicely.

Dr. Frank Costenbader reported a case of gonorrheal conjunctivitis in a child. The boy, aged four years, had been admitted to Children's Hospital with an acutely inflamed right eye, lids swollen completely shut, and much purulent discharge. He also had a purulent urethritis of several days' duration. When first seen it was almost impossible to see the globe or cornea because of intense swelling, congestion, and discharge. The patient was given 25 grains of sulfanilamide daily, and in 24 hours was opening the eye without aid, and the infection was 80 per cent improved. Negative smears were consistent after four days but positive urethral smears were obtained up to the time of discharge (12 days).

Frank D. Costenbader,
Secretary-Treasurer.

SAINT LOUIS OPHTHALMIC SOCIETY

March 25, 1938

DR. ROY E. MASON, *president*

SIMULTANEOUS COLOR CONTRAST AND INSTRUMENT FOR DEMONSTRATING IT

DR. CARL T. EBER read a paper on this subject which will be published in this Journal.

Discussion. Father H. Gruender, S.J., of Saint Louis University, said the modifications of his contrast box introduced by Dr. Eber are excellent. They make it easy to illuminate two contrasting surfaces independently—namely, a small infield and a large outfield—and to regulate with fair precision both the amount and kind of light reflected by each field. What

adds to the value of the instrument is the fact that standard color filters are used both for the infield and the outfield. It is also possible to produce artificially "white" light which approximates the composition of unfiltered sunlight. Thus ideal conditions are created for observing the profound influence which is exerted by the outfield on the infield. In literal strictness the inhibiting effect of the two contrasting fields is mutual but it is proportional to the size of each and to the amount of light reflected by each. Hence by making the infield very small and the outfield comparatively large, and by using very small amounts of light for the infield and comparatively large amounts for the outfield, we reduce the inhibiting effect of the infield on the outfield to a minimum. Thus we can practically consider the infield as the inhibited surface and the outfield as the inhibiting surface. By means of this instrument, then, it is possible to demonstrate experimentally that the characteristic appearance of the infield depends not only on the kind and amount of light reflected by that field and reaching the center of the retina, but also by the amounts and kinds of light reflected by the outfield and reaching the peripheral portions of the retina.

Suppose that we illuminate the infield by four units of "white" light. This light is at its best when the outfield is not illuminated at all: the infield under these conditions looks white. The moment we introduce a small amount of "white" light into the outfield, the infield looks darker. The greater the illumination of the outfield, the darker is the infield. When the illumination of the outfield reaches a certain amount, the four units of light reflected by the infield are below the threshold of vision; the infield looks black. This is brightness contrast.

Suppose we illuminate the infield by yellow light. This light again is at its

best when the outfield is black: the infield looks yellow. If we now introduce yellow light into the outfield, the infield looks a darker shade of yellow. By further increasing the yellow light of the outfield a point is reached where the yellow light of the infield is below the threshold and looks black. This is saturation contrast.

If we illuminate the infield by a small amount of white light, it looks white as long as the outfield is not illuminated at all. If now we introduce red light into the outfield, the infield begins to look bluish green. By regulating the amount of red light in the outfield we reach a point where the infield (illuminated by the same amount of white light) looks a saturated bluish green. This is the first form of color contrast: the neutral color of the infield is changed to a chromatic color. And the color of the infield is always complementary to that of the outfield. By means of this mode of procedure it is possible to make the outfield appear any color. The only proviso is that we introduce into the outfield the color that is complementary to the color desired in the infield.

If we illuminate the infield by yellow light, it looks yellow provided the outfield is not illuminated at all. If we now introduce into the outfield light that is not complementary to the infield, say green light, the yellow infield becomes reddish. If we introduce red light into the outfield, the yellow infield becomes greenish. This is the second form of color contrast.

The importance of these phenomena can be gathered from the fact that it is impossible to avoid simultaneous contrast: in daily life there is always an outfield for every infield. The best we can do artificially is to regulate the illumination of infield and outfield, and this is done by his contrast box with greater precision by the instrument of Dr. Eber. In daily

life we get only the beneficial effects of simultaneous contrast. There are two such effects which need emphasis.

Hering has pointed out that without simultaneous contrast we should not be able to recognize visible bodies by their sensible qualities. Sunlight varies in intensity enormously from morning to noon, from day to day, from month to month, as every photographer knows. A piece of black coal reflects at noon about 50 times as much light as it does early in the morning, and about three times more light than a piece of white chalk does early in the morning. If, then, the sensation aroused by a piece of black coal depended only on the amount of light reflected by it, it should look white at noon, and whiter than chalk does in the early morning. As a matter of fact it does not: it looks about as black at noon as early in the morning. The reason for this is that the illumination of the outfield increases proportionately from morning till noon. This outfield stimulates the peripheral portions of the retina and inhibits the stimulating effect of the infield. It is for this reason that bodies in nature, a piece of coal, a rose, a green leaf, and so forth, have for us a "constant" color in spite of the enormous changes of daylight illumination.

Another beneficial effect of simultaneous contrast is that it makes visual acuity possible. The refractive media of the eye are far from being as perfect as the compound lens of a modern photographic camera is. In other words the best normal eye is slightly astigmatic. But we notice nothing of this "normal astigmatism." For the human eye has the marvelous capacity of correcting this "normal astigmatism" by the rivalry of adjacent retinal areas; that is, by simultaneous contrast. Only when astigmatism goes beyond the slight normal limits is it impossible to correct the defect by simultaneous con-

trast. And only such a degree of astigmatism is called by ophthalmologists "astigmatism," as they understand the term.

It may be possible to use the modified form of the contrast box as a means to detect color blindness, to distinguish the two types of ordinary color blindness, and to distinguish both from color weakness. So far, however, no data are available on this use of the instrument.

Those who wish further details concerning the phenomena of simultaneous contrast, and the correlation of these phenomena with the laws of color mixture, will find this information in Chapter IV of his "Experimental psychology."

THERMOPHORE TREATMENT OF RETINAL DETACHMENT

DR. LAWRENCE T. POST presented 13 cases of retinal detachment treated with the thermophore. Nine of these were surgically successful; that is, the retina was reattached. Previously he had used a different technique in two of these cases, without success. Four of the 13 patients were operated on by others in the Eye Department of Washington University. The method is by no means a cure-all but has certain advantages and is worth studying further. In order to reach far back with the thermophore, there must be a soft eye.

With regard to how much of the choroid and retina is affected by the application, he has made a number of sections of rabbits' choroids after applying the thermophore at temperatures of 160 degrees and 170 degrees for one and two minutes and has been surprised at the sharp-cut lines of reaction. The choroid and retina are cupped in the area of application where the adhesion is formed. Looking with the ophthalmoscope at the point of application of the thermophore there is a white, clean-cut area around which the retina and choroid look normal.

He has never made any section of muscle to which he has previously applied the thermophore. This paper will be published in full in the Journal of the Southern Medical Association.

Discussion. Dr. William Shahan recalled some 30 years ago seeing Dr. Hese using a hypodermic needle to draw out subretinal fluid. He said this was done only because he had to do something and not to cure the detachment. We are just now getting somewhere with treatment of detachments, mostly with diathermy. He has not had a great many cases of his own and he thinks the technique with the thermophore as yet is not perfected. Some cases respond without much surgery. The required temperature is usually from 160 degrees to 170 degrees. This does not produce a very violent reaction, nor much pain, and does produce a good result. In one case he simply applied the heat first and then made the puncture. Reattachment of the retina occurred and stayed that way for three months and then went to pieces.

Dr. Shahan showed his improved thermophore. The conductor in the new instrument will be rather large. In one end is a cylinder, solid brass, soldered in, and the thermophore will be inserted in that end. When using the thermophore at a temperature as high as 170 degrees for a long time, the body of the old thermophore becomes rather hot, so in this new model there is a second jacket placed around the inner jacket and the instrument will remain cool.

Dr. H. Rommel Hildreth reported the results of a laboratory study of the galvanic current as used for retinal detachment. Rabbits' eyes were punctured with the cathode needle, using one milliamperes of current. A central puncture using no current was compared with a series in which the time of application increased from 1 second to 15. All the punctures

appeared alike when examined histologically. At the time the current was applied there was a generous supply of hydrogen bubbles in the vitreous, indicating that the current was acting. From this study, which has been repeated, it would appear that the use of the galvanic current in the treatment of retinal detachment is of no value.

Dr. P. Luedde saw a boy who was injured a year prior to the first examination in June, 1937. At that time he had a macular hole and large flat detachment, so all that existed for visual purposes was the outer field. The thermophore was applied. The field was checked three or four days ago and he had a perfect field except nasally in the upper quadrant, where the thermophore was applied. The thermophore applicator was a 5-by-10-mm. point. The retina at present is entirely reattached.

CASE REPORTS

DR. WILLIAM F. HARDY read reports on the following subjects: 1. Bilateral symmetrical detachments of the retina in a juvenile; 2. Delayed reattachment of retina after operation on an aphakic eye; 3. Orbital hemangiectasia with marked proptosis; Removal with preservation of vision.

H. Rommel Hildreth,
Editor.

MEMPHIS SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

May 24, 1938

DR. J. HARLEY HARRIS, *presiding*

FOREIGN BODY IN THE EYE

DR. E. C. ELLETT reported the case of Mr. E. D. M., aged 37 years, who was first examined on February 25, 1938.

On October 1, 1937, while at work driving a steel pin with a steel punch something struck the right eye. He received medical attention but no X-ray studies were made. The vision of the right eye was 5/10. The eye was slightly red. Tension was normal; the fundus appeared normal except for a few vitreous floaters. There was a small scar at the nasal edge of the cornea and under this a hole in the iris, seen by transillumination only. The X-ray film showed a foreign body in the right eye, 1 by 1 mm., 5 mm. below the horizontal, 0.5 mm. to the temporal side and 6 mm. behind the cornea. No trace of it could be seen with the ophthalmoscope or slitlamp.

The large magnet pulled the foreign body around the lens. It was drawn free of the iris and removed by a keratome incision upward without iridectomy. A silver spatula was passed into the anterior chamber and the foreign body was slid out along it, the spatula protecting the iris.

The patient went back to work April 18, 1938. Except for a small defect in the iris, down and another one in, and a few fine vitreous opacities, the eye is normal. Vision of the right eye is 5/4—2 and J1.

SYMBLEPHARON

DR. PHIL M. LEWIS presented a white man, 65 years of age, upon whom he had recently operated for a symblepharon of the lower lid, consequent upon a burn of the right eye 20 years previously. The adhesion extended from the lower fornix to the upper border of the pupillary space. Vision was reduced to the counting of fingers. The eye had been previously operated on in another city a year or two after the accident, but no improvement followed. Motion of the eye was very limited.

On April 21, 1938, the operation was

performed. The growth was dissected from the cornea and sutured to the inner surface of the lower lid so as partially to line the raw surface. The conjunctiva was dissected up from each side but was found insufficient to cover the defect. Mucous-membrane grafts were cut from the lip and used to cover the raw area on the eyeball and the inner surface of the lid.

The vision is now greatly improved, but considerable corneal opacity remains. The lid is entirely free from the eyeball, so that motion of the eye is normal.

MALIGNANT MELANOMA—SUBSEQUENT DEATH FROM METASTATIC CARCINOMA

DR. PHIL M. LEWIS reported a case of considerable interest which he had followed for a number of years. The patient was first examined in March, 1928, at the age of 57 years, because of headache following reading or sewing. She had a fairly high hyperopia with a small amount of astigmatism. Correction of this gave a vision of 20/20+ in each eye. The fundi were normal except for a moderate degree of sclerosis of the retinal vessels. In August, 1929, she returned complaining of headache and a burning of her eyes. Vision was found to be normal and her glasses required no change. The retinal vessels showed considerable sclerosis, and on taking her blood pressure it was found to be well over 200. She was referred to her physician for treatment.

In May, 1931, she returned complaining that her vision was failing, especially for close range. Proper correction gave normal vision for distance and for near. Seven months later, in December, 1931, she returned because the vision of her right eye was getting very poor. Examination revealed a bullous retinal detachment of the upper, inner quadrant. No tear was found. Tension was 23 mm.;

transillumination was negative. A Gonin ignipuncture was performed and while some improvement was noticed temporarily, the vision soon became worse, and the detachment more extensive. This process continued through 1932 and 1933.

In March, 1934, the eye was found to be completely blind, and she stated that it had been blind for several months. The retina was completely detached and tension was normal to fingers. The eye was not transilluminated as no thought was given to the possibility of an intraocular tumor. In November, 1934, she came in reporting redness, swelling, and pain for the past two days. The eye was found to be very hard, the tension being 70 mm. (Schiotz). Transillumination was good below and nasally, which included the area involved by the original detachment. The upper outer quadrant failed to transilluminate. Enucleation was performed a few days later and a glass ball was implanted.

The eye was sent to the Army Medical Museum at Washington, and Lt. Col. George R. Callendar reported it to contain a malignant melanoma. No X-ray therapy was given. The patient was seen several times during 1935, 1936, and 1937. No recurrence was ever noticed.

In September, 1934, the patient had a panhysterectomy, but the uterine tumor which was present was found to be a myoma. Three years later she was found to have a squamous-cell carcinoma of the vagina which was quite extensive and could not be entirely removed. She was at that time 67 years of age and in bad general condition, having a severe arteriosclerosis with hypertension. She died in March, 1938, of a generalized carcinomatosis. There was no evidence of a tumor in the orbit.

RETINOBLASTOMA WITH METASTASIS

DR. J. WESLEY MCKINNEY reported

the case of A. H., aged five years, whose left eye had been enucleated 13 months ago on account of retinoblastoma. The tumor had shown early invasion of the optic nerve, but the nerve had been sectioned well behind the growth.

One month ago the mother noticed on the right shoulder blade a knot which has gradually enlarged. X-ray showed widespread erosion of the scapula. Examination of the socket showed no evidence of local recurrence and with dilated pupil there was no sign of tumor in the other eye. A biopsy was taken from the scapula tumor. The pathologist reported the tumor to be made up of cells identical with those in the ocular tumor. The tumor is at present being treated with X-ray therapy.

The question arose as to whether this might not be a Ewing's tumor, but it was the consensus of the pathologists who examined the slides that, although the microscopic picture did resemble Ewing's tumor, this was a metastatic retinoblastoma. In the latter case it is certainly unusual that a retinoblastoma should metastasize after one year without local recurrence.

Discussion. Dr. E. C. Ellett recalled only one similar case in which the eye was removed for retinoblastoma and about a year later a mass was found on the left ulna which was diagnosed Ewing's tumor.

J. Wesley McKinney,
Secretary.

OXFORD OPHTHALMOLOGICAL CONGRESS

The Oxford Congress for 1938 was held July 7, 8, and 9. On July 16 the *Lancet* published a good account of the Congress. This contrasts strongly with the usual neglect shown by general medical journals to scientific meetings dealing

with diseases of the eye. The proceedings of this Congress in full will be published in the Transactions of the Ophthalmological Society of the United Kingdom, some time in 1939.

OCULAR PALSIES

PROF. CAIRNS, of Oxford, reported that ocular palsies result chiefly from pressure, or stretching of the nerves in the cranium or in the orbit. Their clinical manifestations depend on the progress of the causative lesions. Orbital abscess paralyzes all the external ocular muscles, partly or completely. Evacuation of the abscess brings prompt recovery. Benign tumors of the orbit disturb the ocular movements but little. Palsies are often the first noticed symptoms of malignant tumors. Metastatic tumors of the roof of the orbit cause diplopia with pain. Ophthalmoplegia with exophthalmos may follow thyroidectomy, or may develop without thyroid disease. Such palsies may arise from carotid aneurysm, tumors of the middle fossa, cyst of a sphenoidal sinus, cranial polyneuritis, tumor of the Gasserian ganglion, or lipid deposits in the bones of the skull. These cases must be studied by modern methods, including radiography of the bones, ventricles, and arteries.

CATARACT

PROF. A. VON SZILY, former Director of the Eye Clinic of Münster, Germany, gave the Doyne Lecture. He took up the pathological examinations and morphologic findings, and the contributions of embryology, biomicroscopy, and biochemistry to our changing views about the lens. Histological slides showed displacement of the nuclear corona, and other features of abnormal development. He traced the development of punctate, lamellar, and nuclear cataracts. Calcium deposits are the most common of chemi-

cal changes in cataract. Cholesterin crystals are found less often. Lack of vitamin C influences the production of cataracts. Lens tissue is especially sensitive to intermediate products of metabolism.

CONTACT GLASSES

MR. F. A. WILLIAMSON-NOBLE, of London, said only recently had it been possible to produce contact glasses that could be worn with comfort by many people. The indications for contact glasses were optical, occupational, and cosmetic. Conical cornea, high myopia, after effects of mustard-gas burns, nebulas and facets of the cornea, any surface irregularity in the pupillary area of the cornea, may produce interference with vision that cannot be remedied by ordinary glasses. But the filling in, by saline fluid, of the space between the cornea and the glass, could produce great improvement of vision. Some patients reported discomfort during the first hour of wearing them; after which they became progressively more comfortable. Of myopic patients tested, 60 percent could wear contact glasses for six hours or more.

INTRACRANIAL AND INTRAOCULAR PRESSURE

PROF. HANS LAUBER, formerly of Vienna, now of Warsaw, spoke on the relation between intracranial and retinal blood pressure and intracranial tension. The relation between retinal venous and arterial pressure varies between 1 to 1.8 and 1 to 3. So long as this normal relation is preserved no papilledema occurs, in spite of high arterial pressure. He described the influence of low arterial pressure in accelerating the progress of optic-nerve atrophy. He pointed out that the circulation in the retina, differs from that in the tissues because the intraocular tension acts on the vessels, especially on the capillaries. If the difference between

diastolic blood pressure in the retinal arteries and the intraocular pressure is less than 20 mm., nutrition of the retina is impaired; especially the oxygen supply is insufficient. This is illustrated in glaucoma and in tabetic optic atrophy, Leber's disease, and retinitis pigmentosa, in which low blood pressure is often found. In such conditions the arterial pressure should be raised and the intraocular pressure kept down by pilocarpine, or by cyclodialysis.

PAPILLEDEMA

DR. VAN HEUVEN, of Utrecht, had checked the relations between venous pulsation seen with the ophthalmoscope and intracranial pressure, and found lack of venous pulsation to be an important sign of early papilledema. The colloid chemical conditions of the optic nerve and surrounding tissues also influence the development of papilledema. He referred to Prof. Lauber's observation that compression of the vein, but not of the artery, causes rapid development of papilledema.

ANESTHESIA OF OPHTHALMIC SURGERY

MR. H. M. TRAQUAIR, of Edinburgh, opened a discussion of this subject. He reviewed the development of the technique for securing local anesthesia for eye work. Total anesthesia has now been achieved by injections around the lids, applying cocaine to the eye, and subconjunctival injections above and below the cornea.

GLAUCOMA

MR. HARRISON-BUTLER illustrated detachment of the zonular lamellae of the lens, in what he called capsular glaucoma. Otto Barkan, of San Francisco, found that the angle of the anterior chamber was often blocked in glaucoma,

and that shreds of capsule might often be found there. Mr. Ridley, of London, called attention to a substance in the tears similar to histamine. It caused a rise of intraocular pressure, through vascular dilatation.

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

SECTION ON OPHTHALMOLOGY

March 11, 1938

DR. WALTER CAMP, *president*

HEADACHES OF OCULAR ORIGIN

DR. A. D. RUEDEMANN of Cleveland gave a talk on this subject.

Discussion. Dr. A. D. Prangen said it is important to see that the patient has a thorough physical, and possibly a neurological, examination in a search for all the possible factors which might be causing the headaches. In cases of chronic headache of doubtful origin it seems best that some one consultant be made a sort of clearing house for all the clinical data and that he make an attempt to put the various component parts of the clinical picture together in an attempt to establish a diagnosis.

Dr. A. D. Ruedemann in answering Dr. Fink regarding children and their headaches said the child himself must be considered. He may belong to a social group in which headaches are common or he may come from more or less inferior stock. Such a child comes in contact with normal individuals and is expected by his parents to carry on as a normal child. We must remember that headache is foreign to the child as he starts out in life and someone must impart to him the idea of headache.

George E. McGeary,
Secretary.

AMERICAN JOURNAL OF OPHTHALMOLOGY

Published Monthly by the Ophthalmic Publishing Company

EDITORIAL STAFF

LAWRENCE T. POST, *Editor*
640 S. Kingshighway, Saint Louis
WILLIAM H. CRISP, *Consulting Editor*
530 Metropolitan Building, Denver
EDWARD JACKSON, *Consulting Editor*
Republie Building, Denver
HANS BARKAN
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The Mayo Clinic, Rochester, Minnesota
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DERRICK VAIL
441 Vine Street, Cincinnati
F. E. WOODRUFF
824 Metropolitan Building, Saint Louis
EMMA S. BUSS, *Manuscript Editor*
6820 Delmar Boulevard, Saint Louis

Directors: EDWARD JACKSON, President, LAWRENCE T. POST, Vice-President, DR. F. E. WOODRUFF, Secretary and Treasurer, WILLIAM L. BENEDICT, WILLIAM H. CRISP, HARRY S. GRADLE.

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PLASTIC SURGERY OF THE EYES

The eye is the feature most observed in the face. Its perfection in appearance, movement, and expression, is most important to the pride, self confidence, and economic and social well-being of its possessor. The cosmetic effect must be thought of in connection with every plastic operation, considered and advised to be done on the eye, or the parts visibly related to it. The danger of untoward cosmetic results may influence the conscientious surgeon to avoid doing or advising operation. Even a squint operation or a cataract extraction may have unpleasant cosmetic sequels for both surgeon and patient.

When an operation should be done to

correct a cosmetic defect from injury, poor repair, cicatricial deformity of trauma, or disease, the ophthalmologist may feel lack of experience in just that kind of operation, so that he hesitates to do it or advise it—although apart from his interest in the patient's welfare, and his own reputation, he may feel that something of the kind is clearly indicated and might properly be done.

The plastic surgery of the eye is likely to be a specialty within the specialty. The surgeon who has had large experience in ophthalmic surgery knows how easily operative results may be disappointing and feels he is in more danger of blame for what he has done than for what he has left undone. He is not likely to begin doing operations of this kind in the hope

of developing skill that will justify his efforts and risks. Plastic operations are more likely to be undertaken by young operators who have seen successful results in the practice of their teachers and who feel they have had the preparation to meet the difficulties and obstacles that beset plastic surgery.

Those who have seen the work and the results achieved in this field by John M. Wheeler, will feel that his untimely death was indeed an irreparable loss. His developed judgment and manual dexterity as well as his large experience gave him a fitness for this work that very few can hope to attain. Nevertheless such work must be done, and it is to the interest of all ophthalmologists that it be done in the most expert manner.

To be fitted for plastic surgery of the eye, one must have a clear and fresh knowledge of the minute anatomy and physiology of the eye and adjoining structures. An operation always changes somewhat the relations of the parts involved, and may so change the nerve and vascular supply as to impair cell life. The skin, mucous membrane, cilia, tarsal tissues, movements of the lids and eyeballs, even the tissues of the nose, and the walls of the orbit, must be considered in plastic surgery, both with regard to their normal anatomy and their physiologic processes of repair. Corneal replacement by grafting is a new branch of plastic surgery. Glaucoma still presents unsolved surgical problems. The nutrition of the transparent tissues of the eye is different from that of all other animal tissues, in ways not well understood.

The maintenance of the curves of the dioptric surfaces and their relation to the retina is a necessary condition of good vision. How these relations are maintained is imperfectly understood. So that any operation on the eyeball is a venture in the dark. The cosmetic effects of oph-

thalmic operations are too important to be ignored, and too uncertain to be disregarded. The updrawn pupil of intracapsular cataract extraction, should give us pause until it is better understood. Cosmetic effects may be thought unimportant; but their implications may be serious. Plastic surgery seeks to improve the condition of living tissues. The experience of the surgeon who does it is of high importance to the ophthalmologist.

Edward Jackson.

CONJUNCTIVAL PEMPHIGUS

There are probably many ophthalmologists who have never seen a case of conjunctival pemphigus. The condition is rare even in the clinic. Textbooks have little to say about it, the statement being usually limited to a brief description of its essentially atrophic character, with some allusion to rarity, obscurity, and hopelessness.

Essential shrinking of the conjunctiva has been classed as a closely related condition, if not actually identical with pemphigus. Both disturbances tend gradually, sometimes in the course of many years, to contraction of the conjunctival sac, formation of adhesions between conjunctiva and cornea, and serious loss of vision. The distinction between the two, so far as any difference certainly exists, lies in the fact that the lesions of conjunctival pemphigus are more or less generally regarded as beginning with the formation of blebs, whose rupture is followed by development of scar tissue. A number of writers, however, have suggested that such blebs probably existed in the cases of essential shrinking but escaped notice on account of the slow and insidious course of the disease.

As regards the general skin and mucous-membrane surfaces of the body the term "pemphigus vulgaris" is applied by der-

matologists to a disorder accompanied by blebs on the skin or mucous membrane. Its differentiation from herpes, urticaria, eczema, drug eruptions, and so on is more or less difficult but depends to some extent upon an exaggerated tendency of pemphigus blebs to break down, leaving moist defects, which in the more severe types are followed by deep inflammation, tissue destruction, and scar formation.

As bearing upon the question of identity between pemphigus and essential shrinking of the conjunctiva, Franke, who assembled 107 cases from the literature, found that one tenth of the cases of essential shrinking had a record of pemphigus in another part of the body.

The appearances encountered in ocular pemphigus are manifestly influenced by local anatomic and secretory conditions. The constant flow of tears, and the movements of the lids and globe, favor maceration and probably increase the liability to secondary infection and the formation of granulation tissue. Symblepharon arises from adhesion between two superimposed areas of erosion.

The few attempts made to explain the nature and causation of this destructive process must be described as unsuccessful. Intestinal toxins and endocrine or general nervous derangement have been incriminated, and more recently there has been some disposition to attribute the disease to a living virus. The fact that conjunctival scrapings, and also the contents of the epithelial blebs, show eosinophilia has been thought to suggest an allergic basis.

A careful analysis of the pathologic processes involved is offered by Meyer (*Klinische Monatsblätter für Augenheilkunde*, 1938, volume 101, page 708), his material being two cases seen at the Freiburg clinic and an old specimen from the Axenfeld collection. In the first clinical case, under observation for thirteen years,

there had for ten years been some doubt as to the diagnosis. In the second patient, in the course of "essential shrinking of the conjunctiva," there were bleb formations on the mucous membrane of the palate and larynx, and the skin also became involved.

The old excised piece of conjunctiva which Meyer was able to study showed a chronic inflammatory process, with development of abundance of young connective tissue. The epithelium had completely lost its mucous character, and there were no goblet cells. There was some evidence in favor of Kreibich's view that the pemphigus bleb develops on the basis of preëxisting inflammation.

In common with reported cases of pemphigus foliaceus of the skin, the specimen showed flat epithelial elevations (rather horizontal gaps than blebs), lamellar exfoliation, marked infiltration of the cutis with round cells, thickening of the epithelial layer, granulation and proliferation, and secondary cicatricial shrinkage.

In the first of the two clinical cases, severe exacerbations alternated with remissions of as much as several months during which no discomfort was experienced. Definite bleb formation was encountered only once in the whole course of the disease, but denuded areas, frequently seen, were regarded as representing the remains of very fugitive blebs.

In the second patient, a man 82 years old, the existence of the condition could be traced back for only two years. The case was a typical one of essential shrinking of the conjunctiva, without any suggestion of bleb formation. As to both conjunctiva and skin, the process was of the malignant and persistent type involving the deeper layers. Although tubercles were encountered in the affected tissue, with epithelioid and giant cells, central necrosis, and infiltration by lymphocytes.

attempts to demonstrate tubercle-bacillus infection were entirely unsuccessful and there was no clinical evidence pointing to such an etiology. In place of bleb formation the epithelium displayed a pronounced tendency to exfoliation.

In attempting palliative treatment of conjunctival pemphigus, one must not be misled by the spontaneous remissions, which may last sometimes for years. One exception only seems possible to the general statement that treatment is practically useless. In the former of the two clinical cases described by Meyer, four plastic operations were successfully performed for the relief of trichiasis and entropion. These operations arrested corneal ulcers which had been induced by the trichiasis, although (it is interesting to observe) there was subsequently distinct evidence of bleb formation on the healed transplants. This is an excellent illustration of the fact that surgical ingenuity may often prove beneficial even in fundamentally incurable conditions.

W. H. Crisp.

GIZA LABORATORY REPORT

This twelfth annual volume for 1937 is similar to its predecessors and of like excellence. The group forms an interesting and valuable collection. It is unfortunate that more organizations cannot publish similar reports. The major difficulty lies in the expense of the project.

Many interesting pathological and clinical cases are given; among them is one of bilateral multinodular episcleritis, supposedly tuberculous, which was cured by tuberculin injections. Two cases of Eales's disease in brothers are reported.

The research section, is as usual, excellent. The work on trachoma has been continued. Giza is undoubtedly one of the most important centers in the world for this study, and anything emanating there-

from must be given serious consideration.

Among the sections that will catch the eye of the reviewer is the experience with sulfanilamide chemotherapy in trachoma. Ten children with active trachoma and pannus—but not secondarily infected—were treated as outlined by the United States Public Health Service. The drug appeared to have no effect on the disease. This is in line with the findings of many observers in the United States. Though there is a truly remarkable improvement in cases of trachoma which have been secondarily infected, the sulfanilamide having cleared up the secondary infection there does not seem to have been much good done for the disease itself.

The uselessness of extract of adrenal cortex in chronic simple glaucoma was demonstrated as anticipated in a small series of cases.

The section on spring catarrh is especially interesting and well done. It is beautifully illustrated in black and white and in colors. The mechanics underlying the various appearances are clearly explained; anatomical arrangements seemingly lie at the basis of these. A capillary leakage with collection of exudate and then absorption more or less paralleling it take place. The picture differs in different regions because of the varying anatomy. In the palpebral type the epithelium is exhausted because the leakage is too rapid for all of it to be successfully passed through the epithelium. Broad papillae are formed which gradually become vascularized, and the characteristic "cobble stones" are formed. The unreliability of trusting to the finding of eosinophilic cells as a differential point, at least in Egypt, is again brought out. In from 60 to 70 percent of hospital patients eosinophiles were found in the conjunctival secretion. This may be due to the prevalence of intestinal parasites in the native population. The better test suggested is that the pal-

pebral conjunctiva be dried and exposed to the air for a few minutes, following which a thin glistening tenacious membrane will form in cases of vernal catarrh.

Many cases have been studied and the author presents a very convincing thesis. The reader cannot fail to want to confirm these slitlamp findings in his own patients.

These Reports are well prepared, valuable, and should have a wide circulation.

Lawrence T. Post.

BOOK NOTICES

AMERICAN RECOMMENDED PRACTICE OF SCHOOL LIGHTING. American Standards Association, New York. Paper bound, 60 pages, 39 illustrations, 1938. Price 25 cents.

The practice recommended in this pamphlet may not be ideal but it is decidedly an advance on the lighting now used in the great majority of schools. A single illustration in it, showing the difference between indoor daylight and that which we live in out-of-doors, will be worth more than the price to any one who thinks about the health of children, or the need for good light in schools. The book has been prepared under the joint sponsorship of the Illuminating Engineering Society of New York and the American Institute of Architects of Washington, D.C. It is arranged in four parts: 1. Lighting and education. 2. Factors which affect lighting and seeing. 3. Natural lighting of schoolrooms. 4. Artificial lighting of school rooms. The last part occupies more space than the other three and has more than five sixths of the illustrations. This, and the fact that a Part 5 (three pages) is devoted to Wiring, may give the impression that the book is simply intended to serve the interests of those who sell electric power and fixtures. But in spite of this, it should be known to all

who are interested in the vision and health of school children.

The one illustration above alluded to, shows, on one page, reproductions of three photographs: one of a playground at noon taken by 10,000 foot-candles of daylight; the second a group of school children outdoors in light ranging from 450 to 700 foot-candles; the third taken in the school-room by natural light, in which the illumination ranged from 240 foot-candles in the window, to 8 foot-candles on the desks at the opposite side of the room. Architects have made such poor use of natural daylight that some provision of artificial light is needed in almost every schoolroom.

It is encouraging to find that the part on "Natural lighting of schoolrooms" begins with a discussion of "orientation of building." Architects have heretofore been given the impossible task of providing for natural lighting in buildings from which daylight was shut off by trees and higher buildings around them. In these days when, in the heart of large cities, high and costly buildings are being torn down to provide parking spaces, because that use would give the best return to the owners of the ground, it should be possible for any school board, holding the ideal of a balanced budget, to provide for natural light by surrounding each school building with parking spaces. The future growing appreciation of the child's need for light and physical development, will bring an understanding to school boards and tax payers that every school should be surrounded by playgrounds. The regular exercises, using the proper apparatus and games for the different grades of children, will increase the value and efficiency of the school more than anything that can be put into the indoor school curriculum.

Every ophthalmologist can profitably read and consider the things set forth in

this book. It will give him new light on the importance of exact correction of errors of refraction, and the balance of ocular movements. The traditions and history of operative ophthalmology, and the importance of hospitals and asepsis, newly discovered, overshadow and obscure the supreme importance of visual function in our present civilization.

Edward Jackson.

BULLETINS ET MEMOIRES DE LA SOCIÉTÉ FRANÇAISE D'OPHTHALMOLOGIE. Volume 51. 647 pages. Paris, Masson et Cie, 1938.

This annual volume records the presentations made during the meetings held May 16-19, 1938. A total of 43 communications was offered, and they cover a number of different subjects, although the majority are devoted to therapeutic and surgical methods in use for various ocular manifestations. While certain reports will have special appeal for different readers, the volume forms *in toto* an interesting and readable collection. Because of the number and diversity of the individual papers, it is difficult to render them into adequate résumés. The meeting of

May 18th was devoted to what might be termed a symposium on cataract, eight different reports being given over to this subject.

It is particularly gratifying to see the adaptation to ophthalmological problems of newer experimental procedures developed in other fields. Thus, a paper by Tillé, Pillet, and Busnel on micro-incineration and tissue spectography presents a new approach to the problem of cataract formation. These newer methods reveal, for example, that while normal crystalline and the amber senile cataract contain neither iron, copper, nor zinc, the white senile cataract contains only copper, and the black cataracts of either spontaneous or traumatic origin contain both copper and iron.

L. A. Julianelle.

GIZA MEMORIAL OPHTHALMIC LABORATORY, Twelfth Annual Report, 1937. Paperbound, 168 pages, 67 illustrations, some in color. Printed by Schindler's Press, Cairo, 1938. Price P.T. 35.

See editorial "Giza Laboratory report," page 443.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

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| 1. General methods of diagnosis | 10. Retina and vitreous |
| 2. Therapeutics and operations | 11. Optic nerve and toxic amblyopias |
| 3. Physiologic optics, refraction, and color vision | 12. Visual tracts and centers |
| 4. Ocular movements | 13. Eyeball and orbit |
| 5. Conjunctiva | 14. Eyelids and lacrimal apparatus |
| 6. Cornea and sclera | 15. Tumors |
| 7. Uveal tract, sympathetic disease, and aqueous humor | 16. Injuries |
| 8. Glaucoma and ocular tension | 17. Systemic diseases and parasites |
| 9. Crystalline lens | 18. Hygiene, sociology, education, and history |
| | 19. Anatomy, embryology, and comparative ophthalmology |

1

GENERAL METHODS OF DIAGNOSIS

Busigin, H. V. Another type of ophthalmoscope. *Viestnik Opht.*, 1938, v. 12, pt. 4, p. 523.

The author has designed an ophthalmoscope attached to a headband, thus leaving the hands free.

Ray K. Daily.

Goldman, Hans. The technique of slitlamp microscopy. *Ophthalmologica* (formerly *Zeit. f. Augenh.*), 1938, v. 96, Nov., p. 90.

The author describes accessories to the slitlamp that simplify several complex procedures. For examination of the fundus, he places a prism in the path of the beam after it leaves the distal lens. By double reflection from two of the surfaces of the prism, the angle between the axis of illumination and of observation is reduced to 5°. When the patient wears a very light contact glass made of a glass substitute, the fundus and the posterior parts of the vitreous can be conveniently examined. For

gonioscopy of the entire chamber angle with the patient seated at the slitlamp, the author has devised a similar light contact-glass. Its anterior surface is flat and it has embedded in it a totally reflecting plane surface which lies at an angle of 64° with the anterior plane. By rotating the glass about its axis all parts of the chamber angle can be brought successively into view. For illumination, the slitlamp is used with the special deflecting prism.

F. Herbert Haessler.

Streiff, E. B. Adaptation of the Nordenson apparatus to keratoscopy and to photography of the anterior segment of the eye. *Ophthalmologica* (formerly *Zeit. f. Augenh.*), 1938, v. 96, Nov., p. 84.

By replacing the +0.75 D. lens in the Recross disc with a +2.25 D. lens, very acceptable photographs of the lids and the anterior segment of the eyeball may be made. By putting a +16.00 D. lens in place of the color filter, vitreous opacities may be photographed. A

translucent Placido disc, 40 cm. in diameter, with four lamps behind it mounted on the distal end of the horizontal tube, converts the instrument into an adequate photokeratoscope.

F. Herbert Haessler.

Viallefont and Lafon. **Entopic pupillometry; spontaneous variations of the pupillary diameter.** Bull. Soc. Franç. d'Opht., 1938, v. 51, pp. 378-381. (See Amer. Jour. Ophth., 1939, v. 22, Feb., p. 226.)

Zamenhof, Adam. **A small illuminator for campimetry.** Klinika Oczna, 1938, v. 16, pt. 5, 592.

The author describes a handlight which projects a circle of light on the campimetric screen. (Illustration.)

Ray K. Daily

2

THERAPEUTICS AND OPERATIONS

Allen, J. H., and Braley A. E. **Staphylococcus toxin.** Amer. Jour. Ophth., 1939, v. 22, Jan., pp. 11-15.

Glover, L. P. **Some uses of sulphanilamide in ophthalmology.** Amer. Jour. Ophth., 1939, v. 22, Feb., pp. 180-184.

Goar, E. L. **Management of the complications of intraocular surgery.** Amer. Jour. Surg., 1938, v. 42, Oct., pp. 62-68.

A discussion of prevention and treatment of the complications of intraocular surgery. Goar prefers iridencleisis to trephining in glaucoma and gives his technique. (3 references.)

Ralph W. Danielson.

Green, J. **The conjunctival flap in ophthalmic surgery.** Amer. Jour. Surg., 1938, v. 42, Oct., pp. 69-77.

Green discusses the use of the conjunctival flap not only in removal of cataracts but also in the following: (1)

rupture of wound after extraction of lens, (2) various complications of trephine operations, (3) keratoplasty, (4) progressive ulceration of the cornea, (5) for covering a shrunken, blind eye to make a bed for prothesis, (6) gonorrheal ophthalmia, to prevent ulceration of the cornea. (21 references.)

Ralph W. Danielson.

Jacqueau, M. **Very long and extensive use of shock medication by intravenous injections of electrauro.** Bull. Soc. Franç. d'Opht., 1938, v. 51, pp. 273-277.

For eighteen years the author has used electrauro intravenously as a means of shock therapy, to the exclusion of all other methods. He estimates that a total of 3,000 injections have been administered. The usual dose was 3 c.c. The indications for use are disturbances following cataract operations, iritis with hypopyon, late intraocular infection following sclerectomy, traumatic perforation of the globe, sympathetic ophthalmia, and infectious or inflammatory states generally.

Clarence W. Rainey.

Kapuscinski, W. J. **Typhoid vaccine in ocular therapeutics.** Bull. Soc. Franç. d'Opht., 1938, v. 51, pp. 277-293.

The author considers that typhoid vaccine acts chiefly by the increased temperature that it produces, and considers it in the same category with hyperthermia induced by other means. He uses a vaccine prepared by the Institute of Hygiene of Warsaw, which has a uniform and constant bacterial count of 1 billion per c.c. The initial dose of 0.01 c.c. is given intravenously. If the temperature does not rise above 39°C., a second dose of 0.03 c.c. is given the day following fall of the temperature induced by the first dose.

Usually a temperature of 40°C., is obtained within four to six hours after the second injection. The injections are given in a series of ten to twelve. A fever of 40°C. should follow each injection. If the patient is not sensitive to the injection the dose is doubled for the following injection. If the patient is oversensitive to the injection, the dose is reduced by a third. The injections are made in the morning, the peak of the temperature rise occurs in the early afternoon, and by evening the patient has a normal temperature. The author reports his results in treating cases of sympathetic ophthalmia, interstitial keratitis, herpes zoster of the cornea, gonococcal conjunctivitis, juvenile recurrent hemorrhage into the vitreous, and retrobulbar neuritis. For tuberculous uveitis, he prefers typhoid vaccine to the use of tuberculin.

Clarence W. Rainey.

Karbowski, M. Iontophoresis with adrenalin in ocular therapeutics. *Acta Ophth. Orientalia*, 1938, v. 1, Oct., p. 9.

Iontophoresis is, according to the author, an easily applicable and harmless method of treatment, and should be used to a greater extent in ophthalmology, especially since it opens new ways of treatment of the anterior and posterior segments of the uvea, the retina, and, perhaps, the lens and vitreous. Adrenalin iontophoresis, while it is as effective as subconjunctival injection, has the additional advantage of not affecting the general circulation.

R. Grunfeld.

Laval, Joseph. Vitamin therapy in ophthalmic practice. *Amer. Jour. Ophth.*, 1939, v. 22, Jan., pp. 33-37.

Lemoine, A. N. Hyperpyrexia in the treatment of ocular syphilis. *Arch. of*

Physical Therapy, 1938, v. 19, Nov., p. 675.

Cases of syphilitic interstitial keratitis, optic neuritis, secondary optic atrophy, primary optic atrophy, and chorioretinitis were treated by hyperpyrexia, induced either by tertian malaria or the hot bath. Results obtained by the use of the hot bath were as good, though not so rapid, as those obtained by malarial parasites. Clearing of salmon patches and corneal opacities in interstitial keratitis, and subsidence of the acute reaction in neuroretinitis, were considered to be more rapid than in other forms of treatment. Primary optic atrophy seemed to be arrested, and vision and fields improved in some instances.

George A. Filmer.

Spaeth, E. B. A review of some modern methods for ophthalmic plastic surgery. *Amer. Jour. Surg.*, 1938, v. 42, Oct., pp. 89-100.

The author appreciates that most of the contents have been published before in various texts and monographs, and also that considerable important detail is not here included. The article is, however, presented as a convenient abstract of some of the principles which underlie ophthalmic plastic surgery.

Ralph W. Danielson.

3

PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Berner, G. E., and Berner, D. E. Reading difficulties in children. *Arch. of Ophth.*, 1938, v. 20, Nov., pp. 829-838.

The modern method of teaching reading by sentences, while it produces rapid and intelligent readers, taxes to the limit the child's powers of attention and concentration. Because of the high degree of visual attention re-

quired, certain minor defects of less importance under older methods have now become significant. Besides gross visual defects, the factors responsible for most reading difficulties are: visual immaturity, low hyperopia, deficient fusion, and deficient fusional convergence. The authors discuss these factors and point out methods of correcting them.

J. Hewitt Judd.

Bettman, J. W., and McNair, G. S. A contact-lens telescopic system. *Amer. Jour. Ophth.*, 1939, v. 22, Jan., pp. 27-33.

Bietti, Giambattista. Researches on the mechanism of action of sympathotrope substances on the light sense. *Boll. d'Ocul.*, 1938, v. 17, April, pp. 279-306.

Different persons having normal eyes or affected by retinitis pigmentosa were tested to find out how their light sense was affected by sympathetic-stimulant drugs such as adrenalin and sympathetic-paralyzing drugs such as lymphoganglin and ergotamin. The conclusions are given in tabulated form. Conjunctival instillation of the first group of drugs is followed by deterioration of light sense. Improvement accompanies the action of the other group of drugs.

The first group of drugs, subcutaneously administered, it is not usually followed by deterioration of light sense, but sometimes even by improvement. Experiments on frogs indicated that the first group of drugs caused, in retina kept in the dark, migration of retinal pigment along the rods and cones toward the external limiting membrane in the "light" position. The second group of drugs, on the other hand, tended to cause migration of the pigment exposed to light toward the

pigmented epithelium, that is, the "dark" position. The experiments with adrenalin showed, however, that the improvement of the light sense was only partly due to migration of the retinal pigment, and that a notable part was played by the vascular factor. Injections of the adrenalin group were followed by vasodilatation in the region of the central artery of the retina, and this mechanism is taken to explain the improvement of light sense obtained with such medicaments after subcutaneous injection.

Melchior Lombardo.

De' Cori, Renzo. Sphygmie oscillations of corneal curvature. *Boll. d'Ocul.*, 1938, v. 17, March, pp. 153-162.

The right eye of a woman of eighteen years was found with the exophthalmometer 1 mm. more prominent than the left eye and to be affected by compound direct myopic astigmatism. During examination with the ophthalmometer the cornea of this eye showed rhythmic changes, its horizontal curve varying from 55 to 55.25 D. and the vertical from 58.5 to 59.25 D.; that is, the radius of the horizontal meridian was shortened from 6.1 to 6.07 mm. and the vertical from 5.75 to 5.68 mm. These changes were synchronous with the pulse, the maximal value appearing during systole, when the astigmatism increased 0.5 D. The article closes with a discussion of probable factors. (Bibliography.) Melchior Lombardo.

Eames, T. H. The speed of picture recognition and the speed of word recognition in cases of reading difficulty. *Amer. Jour. Ophth.*, 1938, v. 21, Dec., pp. 1370-1375.

Essen, Jac. The quality of darkness. (Answer to Ohm.) *Graefe's Arch.*, 1938, v. 139, pts. 4 and 5, pp. 817-838.

Essen answers that Ohm could not have understood his original paper, since Ohm insists that darkness is objectively the absence of light (see p. 453.) Essen explains that he is an investigator in psychology, occupied with the principles of sensory perception and experience in sight and hearing. He is also occupied in physiologic research. Obscurity or darkness is not of a physical nature but an optical sensory perception and is not the opposite of brightness but of the optical sensory perception of clearness. Obscurity or darkness is an absolutely photic experience in which the aphotic factor or the perception of black prevails. Lack of optical differentiation signifies both failure to perceive visible objects in the visual field and exclusion from the real world of sensory experiences. The phenomenon of blindness is psychologically as well as physiologically associated in the narrowest sense with that of obscurity or darkness. Blindness is the particular experienced form of obscurity or darkness.

H. D. Lamb.

Granit, R., Holmberg, T., and Zewi, M. On the mode of action of visual purple on the rod cell. *Jour. of Physiology*, 1938, v. 94, Dec., p. 430.

Measurements were undertaken in dark-adapted eyes of frogs to determine the relationship between the size of the retinal electrical response and the total quantity of visual purple present when the eyes were subjected to a constant test light of wave length 0.500 micra. It was found that the quantity of visual purple in these eyes remained the same as in control eyes, although the retinal electrical response was reduced one third to one half by adaptation. These results were particularly interesting in view of the fact that the retinal electri-

cal response is known to increase during regeneration of visual purple. The authors suggest a hypothesis to account for the apparent discrepancy.

George A. Filmer.

Hawes, R. T. M. Notes on dark adaptation and a single instrument for its investigation. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 103.

The author describes an instrument which he has devised as an attempt to eliminate certain inherent errors in some of the previous instruments for determination of dark adaptation. The tube is completely illuminated, so that the whole retina is bathed in light during the bleaching period. The test object is an arrow which can be moved in any direction without the knowledge of the observer and the illumination is controlled by polaroid discs so that definite percentage and very smooth diminution in the light illuminating the arrow are possible.

Three series of experiments are summarized; (1) as to the number who saw the arrow illuminated by 60 percent of the available light at varying times after the bleaching light was extinguished; (2) for determining whether familiarity with the instrument altered the findings; and (3) the effects of administration of vitamin A in halibut-liver oil on eleven of the worst subjects.

Beulah Cushman.

Karbowski M. The pathology of color perception. *Graefes Arch.*, 1938, v. 139, pt. 3, p. 480-502.

The disturbances of normal perception of color located in the eye are divided into those due to opacities in cornea, lens, anterior chamber, and vitreous and those due to changes in the function of the retinal cones. Any

diminution in the transparency of the ocular media causes exclusion of the rays at the blue end of the spectrum. Changes in the function of the cone include paresis, paralysis, or spastic contraction of the myoid in the inner portion of the cone. In both instances, only one platelet in the outer portion of the cone, corresponding to a single color, can under such conditions come into the focus of the light rays. Thus the erythroptia and red and green blindness of the snow-blind are explained. Nutritional disturbances or toxic influences may influence color vision by changing the absorptive capacity of the color-sensitive cone and the ability of the physical stimulus to change to nervous energy. A smaller part of the blood supply to the cones comes from the retinal blood vessels. Accordingly, in all forms of choroiditis, choroidal tumor, choroidal tear, choroidal detachment, retinal detachment, and myopia, the violet and blue rays perceived by the platelets at the tip of the cone are first affected, whereas the red and orange rays perceived by the platelets at the base of the outer part of the cone are less disturbed. In addition, the fact that blue is also poorly distinguished in degenerative disorders of the retina, such as hypertonic, nephritic, diabetic, tuberculous, and syphilitic retinitis, together with pigmentary degenerations of the retina, would indicate that in all these conditions the etiologic factor comes from the choroid. On the other hand, when the nutrition from retinal blood vessels is concerned, recognition of red is first disturbed. This would occur in early inflammatory and degenerative processes of the second and third neurons of the retina. The primary cause might be spasm or embolus of the retinal arteries, passive hyperemia, or thrombosis of the retinal

veins. It could be an early differential symptom in multiple sclerosis, pituitary tumor, or retrobulbar neuritis but is also present in optic atrophy from glaucoma, from embolus of the central retinal artery, and from tabes. Changes in the visual fields for red may be either contraction, quadrant hemianopsia, central or paracentral scotoma, or homonymous or heteronymous hemianopsia.
H. D. Lamb.

Kolačný, J. Disturbances of liver function and their relation to reduction of dark adaptation. Bratislavske Lekarske Listy, 1938, v. 18, Oct., p. 63.

Systematic adaptometric studies on patients with clinically recognized disturbances of liver function yielded in every case a reduction of ocular adaptation for darkness. Hemeralopia, however, was only manifested in a few cases, and was usually latent, the patient knowing nothing of its existence, and the hemeralopia being indicated merely by the adaptation curve. The author assumes that the hemeralopia existing in these cases is to be regarded as a consequence of disturbed rate of regeneration of the visual purple, caused by a deficiency in vitamin A. Such deficiency arises from disturbances of function in the liver, where the transformation of carotin into vitamin A takes place. Thus in cases in which disturbance of liver function is merely presupposed (but cannot be confirmed by existing clinical methods) the hemeralopia is to be regarded as an early symptom of this disturbance. After administration of vitamin A in the cases here reported, an improvement in adaptation was demonstrated adaptometrically.
W. H. Crisp.

Kravkov, C. V. The relation of visual acuity to illumination. Viestnik Opht,

1938, v. 12, pt. 4, p. 525. (See *Amer. Jour. Ophth.*, 1938, v. 21, Dec., p. 1407.)

Lancaster, W. B. *Aniseikonia*. *Arch. of Ophth.*, 1938, v. 20, Dec., pp. 907-912; also *Trans. Amer. Ophth. Soc.*, 1938, v. 36.

This term was coined by the author for a difference in size of the optical images of the two eyes. He discusses the consequences and symptoms arising from decompensation, and points out that the amplitude of adjustment in compensation for aniseikonia is limited as compared with the amplitude of accommodation or the amplitude of fusion. The chief causes of aniseikonia are anisometropia, the wearing of glasses of different magnifying power for the two eyes, and asymmetric convergence. When the eyes are unable to compensate for the aniseikonia suppression usually results. The three chief objections or criticisms to the claim that aniseikonia is an important factor in eyestrain are: first, that the benefit alleged to follow the use of eikonic lenses is really due to suggestion or psychotherapy, second, that eikonic lenses may have a considerable prismatic effect and may thus produce anisophoria, and third, that asymmetric convergence produces difference in size greater than many of the differences claimed clinically to cause symptoms but is compensated for by an automatic increase in the size of the optic image of the adducting eye.

J. Hewitt Judd.

Litinskii, G. A. *Monocular depth perception and the method of its determination*. *Viestnik Opht.*, 1938, v. 12, pt. 4, p. 532.

The author attributes the general belief in the absence of monocular depth perception to the fact that all depth-

perception apparatus is constructed for binocular tests. He describes an apparatus for measuring monocular tridimensional perception, which he designates as perception of solidity. He concludes that perception of solidity is a monocular as well as a binocular function. Its qualitative characteristics may be demonstrated on his apparatus. The physiologic threshold of solidity perception is 1 mm. for the better eye. In 72.5 per cent of cases monocular perception of solidity is equal to binocular perception, in the rest of the cases it is somewhat lower. The right eye is superior to the left eye in this function. Influence of sex and age is not apparent.

R. K. Daily.

Ludvigh, Elek. *Determination and significance of the scotopic retinal visibility curve*. *Arch. of Ophth.*, 1938, v. 20, Nov., pp. 713-725.

By utilizing experimental determinations of the selective absorption of light by the refractive media of the human eye, a scotopic ocular visibility curve, expressed in terms of energies, is transformed into a scotopic retinal visibility curve, expressed in terms of quanta by application of the Stark-Einstein law of photochemical equivalence. This curve is asymmetric and agrees with that representing the modern determination of the absorption spectrum of visual purple. The author briefly discusses the significance of the scotopic retinal visibility curve with respect to Kundt's rule, the Purkinje phenomenon, the purity of visual purple solutions, the b wave of the electroretinogram, and certain visual theories.

J. Hewitt Judd.

Maisler, S. *A new refractor suspension*. *Arch. of Ophth.*, 1938, v. 20, Oct., pp. 1044-1045. To an adjustable table

is attached a standard supporting a chin rest and a large loop of tubing from the top of which is suspended the refractor. The instrument is shown in a photograph. J. Hewitt Judd.

Mann, Ida. *Applied optics*. Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 1, p. 109.

An excellent historical survey of the development of the contact lens in the one hundred years since Thomas Young presented the theory in *Philosophical Transactions* for 1801 is given. The subject is presented under three aspects, namely, the optical principles involved, the causes of intolerance, and the therapeutic indications.

Beulah Cushman.

Martin, L. C. *A standardized lantern for testing color vision*. Brit. Jour. Ophth., 1939, v. 23, Jan., pp. 1-19.

In an article not lending itself to abstract, the author discusses production and standardization of a lantern for use by the Board of Trade, with the Medical Research Council advocating employment of a similar lantern for the Royal Navy. The experiments which led to the standardization are fully discussed. (Figures, tables.) D. F. Harbridge.

Obrig, T. E. *A cobalt-blue filter for observation of the fit of contact lenses*. Arch. of Ophth., 1938, v. 20, Oct., pp. 657-658.

For observing the accuracy of the fit of a contact glass, a buffer solution containing one drop of fluorescein is used and is viewed with a dense cobalt-blue filter placed between the source of illumination and the eye. This produces a brilliant yellow-green glow wherever the contact glass is not in contact with the cornea or conjunctiva and a dark area where the lens touches the cornea and conjunctiva. J. Hewitt Judd.

Ogle, K. N. *Induced size effect: 1. A new phenomenon in binocular space perception associated with the relative sizes of the images of the two eyes*. Arch. of Ophth., 1938, v. 20, Oct., pp. 604-623.

The literature is briefly reviewed and the apparatus used for quantitative study of geometric and induced size effects is described. The data obtained are tabulated and are shown graphically. In addition to the change in apparent rotational position of the surface seen binocularly when a change is introduced in relative sizes of the ocular images in the horizontal meridian, a new and unexpected phenomenon of apparent rotation of the binocular visual field caused by a difference in the size of the image in the vertical meridian was found. Its exact cause is not clear. However, three facts have been determined. First, a one-to-one ratio of the maximum sensitivities of the induced to the geometric effect exists, though the two effects are opposite in sign; second, the effect reaches a maximum value for differences in size of the images in the vertical meridian greater than 5 or 6 percent; third, above this difference the induced effect decreases slowly. J. Hewitt Judd.

Ohm, J. *What is darkness? Remarks on the essay of Jac. v. Essen, etc*. Graefe's Arch., 1938, v. 139, pts. 4 and 5, pp. 811-816.

Ohm cannot agree with Essen's psychologic description of darkness as a lack of optical differentiation in space (see Amer. Jour. Ophth., 1939, v. 22, p. 206). To Ohm, darkness means objectively the absence of light, or of ether waves of certain wave-length, and blindness means not a blurring but an inability to perceive light. The study of

nystagmus teaches that in miners, and in young children who grow up in badly lighted dwellings, nystagmus results from insufficient lighting. Darkness is a positive experience to many blind persons, just as black and darkness are employed in common speech and poetry as something positive.

H. D. Lamb.

Seidel, E. The physiology of the process of accommodation in the human eye. *Graefe's Arch.*, 1938, v. 139, pt. 3, pp. 513-519.

Observations in a series of otherwise sound young albinotic human eyes were made with the eye focused for distant and for near vision while the direction of gaze remained unchanged. Examination with the ophthalmoscope disclosed that when the eye was accommodating to fix on a point at 10 cm. distance, the lens equator gradually contracted toward the lens axis, so that the equatorial diameter was diminished about 1 mm. If 1-percent atropine had been instilled one hour previously, this contraction of the lens equator did not occur.

H. D. Lamb.

Semeikin, B. E. Structural defects of Nagel's adaptometer. *Viestnik Opht.*, 1938, v. 12, pt. 4, p. 520.

A criticism of the adaptometer as manufactured in Russia.

Ray K. Daily.

Sudranski, H. F. An evaluation of homatropine-benzedrine cycloplegia. *Arch. of Opht.*, 1938, v. 20, Oct., pp. 585-596.

The refraction was determined for three groups of 25 patients, each group having similar age limits, to compare the cycloplegia obtained by homatropine hydrobromide plus cocaine hydro-

chloride, by homatropine and benzedrine, and by homatropine in one eye and homatropine-benzedrine in the other. Fifteen patients were studied to determine the exact cycloplegic effect of a 5-percent solution of homatropine and a 1-percent solution of benzedrine, used separately. The author concludes that a 5-percent solution of homatropine hydrobromide combined with a 1-percent solution of benzedrine sulphate may be recommended for production of cycloplegia, because the homatropine alone causes complete cycloplegia, the synergistic action between the two drugs produces good mydriasis, and the cycloplegia is of very short duration due to the small amount of homatropine used. J. Hewitt Judd.

Tron, E. Z. Refraction of the aphakic eye. *Viestnik Opht.*, 1938, v. 13, pt. 4, p. 445.

From study of aphakic eyes the original refraction of which was known, and from the calculated aphakic refraction of eyes which had been examined with Tscherning's ophthalmophakometer, the author concludes that the same original refraction may lead to various aphakic refractions, and that the same aphakic refraction may be found in originally different eyes. These variations are accounted for by different combinations of the anteroposterior axis of the eye, the refractive power of the cornea, and that of the lens. Variations in the refraction of the aphakic eye thus depend on the various optical combinations of the aphakic as well as the original eye. From the calculated coefficient of correlation between the refraction of the eye previous to and after extraction of the lens, it is evident that the refractive power of the lens is the most significant factor in variations in refraction.

Ray K. Daily.

Vianna, A. M. A family of daltonians. *Ann. d'Ocul.*, 1938, v. 175, Dec., pp. 901-910.

The genealogical table of a color-blind family is given together with a brief discussion of tests for color-blindness and mendelian probabilities.

John M. McLean.

Weskamp, Carlos. Uniocular diplopia. *Arch. de Oft. de Buenos Aires*, 1939, v. 13, June, p. 279.

A review of the literature on the theories of uniocular diplopia other than the type due to aberrations of the refractive media, polycoria, and dislocation of the lens. Edward P. Burch.

4

OCULAR MOVEMENTS

Apple, Carl. Congenital abducens paralysis. *Amer. Jour. Ophth.*, 1939, v. 22, Feb., pp. 169-173.

Bielschowsky, A. Lectures on motor anomalies. 6. Principles of surgical treatment. *Amer. Jour. Ophth.*, 1939, v. 22, Feb., pp. 145-153.

Chavasse, F. B. Primitive sight and human squint. *Liverpool Med.-Chir. Jour.*, 1938, v. 46, pt. 1, p. 19.

The author takes exception to the statement that "binocular vision is a late acquisition in phylogeny." He states that in man the developmental period of binocular vision is more prolonged. Not until the age of three years is it ordinarily complete.

There is perversion of reflexes which become perfected and fixed at an early age, making it obligatory not to regard too lightly a lapse of binocularity in an infant. F. M. Crage.

Duguet. Parinaud's congenital syndrome. *Bull. Soc. d'Opht. de Paris*, 1937, July, p. 424.

Case report showing vertical paralysis, complete lack of convergence, corectopia, miosis, and ptosis. It is ascribed to a lesion in the hypothalamic region. Five previous cases have been reported. (5 references.) Harmon Brunner.

Howard, W. H. Monocular protection versus monocular occlusion. *Amer. Jour. Ophth.*, 1939, v. 22, Feb., pp. 156-160.

Jameson, P. C. Technique of scleral fixation of extraocular muscles. *Amer. Jour. Surg.*, 1938, v. 42, Oct., pp. 25-29.

The subject of scleral fixation is thoroughly reviewed, including the technique of scleral suturing in the region of the equator, instrumentation, the choice of needle, and the advantages of catgut. (3 figures, 6 references.)

Ralph W. Danielson.

Majewski, Kasimierz. Presbyopia and exophoria. *Klinika Oczna*, 1938, v. 16, pt. 5, p. 535.

The writer calls attention to the exophoria which accompanies presbyopia, and which he attributes to relaxation of convergence caused by weakening of accommodation. Ray K. Daily.

Peter, L. C. Present status of tendon transplantation of the ocular muscles. *Amer. Jour. Surg.*, 1938, v. 42, Oct., pp. 30-38.

An excellent discussion of the technique used in the various situations where tendon transplants are indicated. (4 figures, 4 references.)

Ralph W. Danielson.

White, J. W. Surgical technique in tenotomy of the inferior oblique muscle. *Amer. Jour. Surg.*, 1938, v. 42, Oct., pp. 83-88.

This article is difficult to abstract

but should be read by anyone interested in the operation. (3 references.)

Ralph W. Danielson.

Ziering, Josef. The function of the squinting eye and the squint deviation. *Graefe's Arch.*, 1938, v. 139, pts. 4 and 5, pp. 759-789.

In examination of 112 patients with squint, the findings included the following information: (1) monocular function of the squinting eye, its ability to fix, visual acuity without and with correction, its visual field with the perimeter and scotometer; (2) whether and in what respect the squinting eye works with the fellow-eye; (3) the kind, amount, and character of the squint deviation. All the author's cases with high-grade amblyopia, where the visual fields could be determined, presented either a central (usually relative) or a paracentral scotoma. Amblyopia is caused by anisometropia, when no fusion exists, and the eye with less refractive error and the better image is used, the other eye ignored. When both eyes have about the same change of refraction, alternating squint prevails in the absence of fusion.

H. D. Lamb.

5

CONJUNCTIVA

Cornet, Emmanuel. Concerning some symptoms of trachoma described by Keller in 1937. *Rev. Internat. du Trachome*, 1938, v. 15, Oct., p. 165.

The author reviews several publications of Keller and discusses some of the points brought out. The disease is a familial one but primary infection may occur in the adult. The interstitial keratitis of syphilis is easily distinguished from the pannus of trachoma. Corneal sensitivity in trachomatous pa-

tients shows great variability, certain zones being more insensitive than others. The author distinguishes three varieties of trachoma: (1) pure trachoma, (2) paratrachoma or that secondarily infected, (3) that associated with other palpebro-conjunctivo-corneal diseases. J. Wesley McKinney.

De Lord. Treatment of trachomatous pannus by subconjunctival autohemotherapy. *Bull. Soc. d'Opht. de Paris*, 1937, July, p. 372.

Report of six cases treated with 1-c.c. subconjunctival injections of whole blood; at the same time using mercuric-chloride rubs on the superior tarsal conjunctiva. There was immediate improvement in the pannus.

Harmon Brunner.

Grüter, Wilhelm. Microstructure of epithelial cells and its significance for the etiology of trachoma. *Rev. Internat. du Trachome*, 1938, 15th yr., Jan., pp. 9-14. (In German.) (See *Amer. Jour. Ophth.*, 1938, v. 21, Aug., p. 946.)

Jaeger, Ernst. Operative method for pterygium. *Klin. M. f. Augenh.*, 1938, v. 101, Nov., p. 741.

The method is described in detail. Its advantages are: (1) Healthy conjunctiva lies opposite the disturbed corneal area, and this prevents a relapse. (2) The scar which closes the conjunctiva lies in healthy tissue above the diseased area, so that soft smooth cicatrization is possible. C. Zimmermann.

Kapuscinski, Witold, *Bacteriology of trachoma*. *Klinika Oczna*, 1938, v. 16, pt. 5, p. 664.

A lecture on trachoma for practicing physicians, covering thoroughly the published material on the subject.

Ray K. Daily.

Katznelson, A. B., and Pris, I. I. Phlyctenular eye diseases and tuberculosis. *Viestnik Ophth.*, 1938, v. 12, pt. 4, p. 447.

On the basis of 270 cases of phlyctenular keratoconjunctivitis the author comes to the following conclusions: a tuberculous etiology may be considered established on the basis of clinical and roentgenologic findings as well as of tuberculin reactions. The majority of cases of phlyctenular conjunctivitis occur between one and eleven years of age, and females are affected more frequently than males. The majority of patients have clinical and roentgenologic changes, active in character, in two thirds of the cases. In all cases, even in the absence of clinical signs there is a high sensitivity to tuberculin, although there is no parallelism between the intensity of the disease and of the tuberculin reaction. The younger the patient, the greater the percentage of clinical symptoms. Among the active forms of tuberculosis the infiltration type predominates. The presence of cavernous changes makes the prognosis of the ocular infection more grave. Active clinical tuberculosis is most frequently found in cases of avascular keratitis, less frequently in pannus, and in 50 percent of phlyctenular conjunctivitis. Phlyctenules of the limbus and avascular keratitis are early manifestations of tuberculosis. Pannus develops after recurrent attacks and is therefore seen in older people. Exacerbations of pannus keratitis are less dependent on the toxicity of the tuberculous focus than are other forms of phlyctenulosis. Phlyctenular keratoconjunctivitis is frequently the only symptom of active tuberculosis and should lead to early diagnosis of the disease.

Ray K. Daily.

Kirk, R., McKelvie, A. R., and Hussein, H. A. Sulphanilamide in the treatment of trachoma. *The Lancet*, 1938, v. 235, Oct. 29, p. 994.

Twenty-five cases of trachoma were treated by sulphanilamide by mouth, $7\frac{1}{2}$ grains three times a day for seven days, with seven-day intervals between courses. Encouraging results were reported, especially in cases showing pannus and keratitis. George A. Filmer.

Lijo Pavia, J. Prevention of blindness. Silver acetate or nitrate in the prevention of ophthalmia neonatorum. *Rev. Oto-Neuro. Oft.*, 1938, v. 13, July, p. 171.

The author feels that silver acetate is a safer drug to use than silver nitrate in Credé treatment of the new-born. The acetate is less soluble and therefore cannot be used in high concentrations. This obviates the possibility of corneal damage if too high concentrations are used by mistake. He believes the acetate is as effective as the nitrate.

Edward P. Burch.

Lijo Pavia, J., Irigoyen, L., and Tartari, R. A. Conjunctival xerosis. Anatomico-pathologic contribution. *Rev. Oto-Neuro. Oft.*, 1938, v. 13, Aug., p. 189.

The authors report two cases of xerosis of the conjunctiva which were observed clinically. A biopsy was made in one case and the tissue subjected to microscopic study. Essentially the lesion consisted of a regressive metaplasia of the conjunctival epithelium to the cutaneous type, with keratinization of the superficial layers, vacuolization and hyalinization of the malpighian layer, and invasion by melanophores and melanoblasts. The authors point out that the conjunctival lesions con-

stitute but one aspect of ophthalmic xerosis and that the visceral lesions which result from avitaminosis with respect to vitamin A may be of a very grave nature. (Photomicrographs.)

Edward P. Burch.

Madroskiewicz, M., and Przybylkiewicz, Z. Tuberculosis of the conjunctiva and so-called Parinaud's conjunctivitis. *Klinika Oczna*, 1938, v. 16, pt. 5, p. 561.

A review of the literature and a report of a case of tuberculosis of the conjunctiva caused by the bovine tubercle bacillus. The bacilli were found in conjunctival granulations, and in the secretion from a necrosed preauricular lymph gland. The diagnosis was confirmed by inoculation into a guinea pig. X-ray therapy and cauterization with lactic acid were ineffective, and the granulations were removed surgically. Recovery followed without recurrence in the eyes, but with recurrence in a preauricular lymph gland. (Illustrations.)

Ray K. Daily.

Magitot and Rossano. Propagation or superinduced infection in a case of bilateral tuberculous conjunctivitis. *Bull. Soc. d'Opht. de Paris*, 1937, July, p. 383.

A six-year-old girl with a tuberculous ulcer in the pharynx subsequently developed bilateral dacryocystitis and conjunctivitis. One eye had a conjunctival ulcer, the other follicles. The etiology is considered more likely one of extension than of superinduced infection, although the child lived in a tuberculous family.

Harmon Brunner.

Meyer, F. W. Essential shrinking of the conjunctiva or pemphigus? *Klin. M. f. Augenh.*, 1938, v. 101, Nov., p. 708.

Two cases of pemphigus foliaceus of the conjunctiva are described, occurring in a man of 84 and one of 28 years. Histologic description is given in detail. The two conditions are regarded as closely related. (See editorial this issue, p. 439.)

C. Zimmermann.

Onfray, D. B. A case of vernal conjunctivitis treated with radium. *Bull. Soc. d'Opht. de Paris*, 1937, July, p. 367.

The patient had had one eye treated with radium thirteen years earlier. He presented keratinization of the skin, notching of the lid, blanching of cilia, leukoplakia of the tarsal conjunctiva with sclerosis, pannus-like growth over the cornea, and anterior cortical cataract. The untreated eye was healthy and free from signs of vernal catarrh. The authors feel that radium therapy is unwarranted in these cases. (3 references.)

Harmon Brunner.

Thygeson, Phillips. Sulphanilamide therapy of inclusion conjunctivitis. *Amer. Jour. Ophth.*, 1939, v. 22, Feb., pp. 179-180.

6

CORNEA AND SCLERA

Amsler, Marc. Minimal keratoconus of Javal. *Ophthalmologica* (formerly *Zeit. f. Augenh.*). 1938, v. 96, Nov., p. 77.

The author describes and illustrates a characteristic of minimal and incipient keratoconus by which it may be unequivocally recognized. It is an asymmetry of its surface reflections, readily demonstrated by means of the Placido disc or the mires of an ophthalmometer. The image of the horizontal axis of the Placido disc is not at right angles to that of the vertical axis, but deflected

several degrees. Such an angle also exists between the right and left images of the mires of the ophthalmometer.

F. Herbert Haessler.

Amsler, M. Note on the evolution of keratoconus. *Bull. Soc. Franç. d'Opht.*, 1938, v. 51, pp. 326-333.

Using as pathognomonic sign a depression of the horizontal axis of the keratoscopic image, obtained photographically, the writer reports his conclusions after study of 131 subjects, 105 of whom have been followed for over ten years. The malady makes its appearance in the years following puberty, has little tendency to progress, has never been observed to lessen or improve, is characterized often by crises of pain, redness, and severe irregular astigmatism. The crises disappear without seemingly being a part of any evolutionary changes in the malady.

Clarence W. Rainey.

Bonnet, P., and Gate. Interstitial keratitis observed in the secondary phase of acquired syphilis. *Bull. Soc., d'Opht. de Paris*, 1937, July, p. 417.

Interstitial keratitis developed in a 27-year-old female seven days after institution of arsenical therapy. About twenty Wassermanns had been negative in the two years before the positive reaction, after which treatment was given. There was the characteristic clouding of the corneal parenchyma, with deep vascularization.

Harmon Brunner.

Cornet, Emmanuel. Conjunctivoplasty of the cornea, quantitative vision. *Ann. d'Ocul.*, 1938, v. 175, Dec., pp. 914-916.

In cases unfavorable for keratoplasty, a central corneal leukoma may be ex-

cised and the defect covered by a sliding tongue of conjunctiva. As this flap heals over the hole, its translucency gives a completely blind eye "minimal vision."

John M. McLean.

Cornet, Emmanuel. A technique of corneal graft "in stenopeic slit." *Ann. d'Ocul.*, 1938, v. 175, Dec., pp. 910-914.

After a brief review of methods of keratoplasty, the author presents his method of grafting a horizontal rectangle. A conjunctival flap just wide enough to cover the graft and long enough to stretch across the cornea is prepared so that hinged at the limbus it will cover the graft, epithelial side down. The conjunctival defect is closed. The donor eye (apparently rabbit rather than human) is enucleated, washed in serum, and its entire cornea removed. This is placed in a special graduated clamp and a strip 3 mm. wide and 6 mm. long marked out on it. Intracorneal sutures are placed 1 mm. from each end and the graft excised. An area of the same size is marked on the recipient cornea, long axis horizontal, with a metal template, and is excised. Any presenting iris tissue is cut off. Cataractous lens, if present, is then extracted through this opening, extracapsularly. Any existing cyclitic membrane is incised. The intracorneal graft sutures are then passed through the edges of the defect in the cornea at the appropriate points and the graft drawn into place with them. The inverted conjunctival flap is fastened in place under tension and the corneal sutures tied over it. The corneal sutures are removed by the third day and the flap by the tenth.

No cases are described, nor are any results reported. John M. McLean.

Culler, A. M. The pathology of

scleral plaques. *Brit. Jour. Ophth.*, 1939, v. 23, Jan., pp. 44-50.

Described are five cases of degenerative plaques in the sclera mesially, one studied histologically. Each case is described in detail. The plaques occur chiefly in patients over sixty years of age. The opinion of the author is that no clinical symptoms arise from the lesions, and that the histological appearance is that of a degenerative rather than of a developmental defect. (Figures, bibliography.)

D. F. Harbridge.

Dejean and Artières. Experimental study of the healing action of insulin on corneal wounds. *Bull. Soc. Franç. d'Opht.*, 1938, v. 51, pp. 303-307.

Using three-month-old rabbits, the authors removed a superficial portion of the cornea with a 20-mm. trephine, and noted the time necessary for regeneration of the loss of substance, by observing the staining of the cornea with methylene blue. They conclude that a daily injection of 10 to 15 units of insulin shortens the healing period from two to four days. Insulin in ointment form did not have any effect.

Clarence W. Rainey.

Ellis, O. H. Superficial marginal keratitis. Clinical and anatomic findings in fellow eyes. *Amer. Jour. Ophth.*, 1939, v. 22, Feb., pp. 161-168.

Kapuscinski, W. The influence of radium on interstitial keratitis. *Bull. Soc. Franç. d'Opht.*, 1938, v. 51, pp. 308-317.

The optimum dose was found to be 66 mg. of radium element, placed in a platinum filter 1 mm. thick, held at a distance of 2 cm. from the eye for six hours. The majority of the patients had the disease six months or less. The final

vision of twenty-two percent was 5/5. The best results were obtained in the earliest cases. Improvement was noted in a few weeks, and took place more rapidly and to a greater extent than in untreated cases. The author did not observe the formation of cataract in any of the cases treated.

Clarence W. Rainey.

Motolese, A. Hypopyon keratitis and hypertony. *Bull. Soc. Franç. d'Opht.*, 1938, v. 51, pp. 382-399.

The author studied the effect of induced hypertension upon the course of infected ulcers of the rabbit cornea produced by inoculating the cornea with streptococci, pneumococci, and staphylococci. He concludes that hypertension exerts an unfavorable influence upon the course of the disease.

Clarence W. Rainey.

Pandelese, C., and Valdman, J. Rosacea keratitis. *Arch. d'Opht.*, etc., 1938, v. 2, Dec., p. 1080.

The authors review the literature and history of rosacea keratitis, and describe three typical cases. They point out the polymorphism of the lesion, varying from true ulcers to simple zones of infiltration and leucomata of fibrous tissue. The blood vessels vary in size according to the stage of the lesion, being largest in the ulcerous stage. The limiting furrow of the necrotic lesion is deeper in one part than another. The cicatricial opacities lie over an area of cornea which is thinned. The authors treated the cases with success, using 1-percent silver nitrate, zinc-ichthyol ointment, milk diet followed by a milk and vegetable diet, and occasional dry heat from the galvanocautery. (Bibliography.)

Derrick Vail.

Rhodes, A. J., *Studies on the bacteriology of hypopyon ulcer*. Brit. Jour. Ophth., 1939, v. 23, Jan., pp. 25-42.

This paper is the first in a series of studies carried out by the W. H. Ross Foundation for the Study of Prevention of Blindness.

Under part 1, concerning the conjunctival flora of healthy coal-mine workers, the author deals with preparation of cultures, classes of workers examined, mines visited, controls, and results. It was found impossible, because of varying conditions of dust, moisture, ventilation, and so on in the various pits, to compare one mine worker with another. The percentage of various organisms in the whole pit is noted in some instances, while the percentage present in the total of 658 men examined is recorded in others. *Staphylococcus albus* and diphtheroid bacilli were present in quantity, while pigmented staphylococci were not so commonly found. Underground workers did not demonstrate a flora essentially different from that of surface workers. Those most apt to contract the disease are those most exposed to corneal trauma, or the miners and brushers. Under part 2, as to the conjunctival flora of shale-mine workers, the same procedures are reviewed, with the finding that shale-mine workers nurture a flora composed in part at least of potential pathogens. The opinion is maintained, as based on both types of mine workers examined, that the source of infection in hypopyon ulcer is from organisms already present in the conjunctival sac and that the conjunctival flora definitely exposes the mine worker to infection. (Tables, references.) D. F. Harbridge.

Rubbrecht, R. *The surgical treatment of corneal conditions*. Bull. Soc.

Franç. d'Ophth., 1938, v. 51, pp. 318-325.

The author discusses a method of transplanting a thin layer of neighboring conjunctiva, which is generally applicable to a large number of corneal maladies, especially those of the epithelium and the superficial layers. The affected tissue is excised with a special lancet, and the loss of tissue covered with bulbar conjunctiva. The corneal transparency is greater than from the scar of the original process.

Clarence W. Rainey.

Terry, T. L. *Some physiological and anatomical aspects of the cornea affecting its pathology*. Amer. Jour. Ophth., 1939, v. 22, Feb., pp. 153-155.

Thomas, J. W. T. *Corneal transplantation*. Brit. Med. Jour., 1938, Oct. 8, p. 740.

Results of 56 operations on 48 eyes are given. The technique was the same as used by the author in his previous cases, except for two modifications; namely, using saline instead of oil for receiving the graft, and so arranging the cross stitches that the knots do not lie on the graft or its edges.

Over 60 percent of the operations and 66 percent of the eyes operated on were successes. Five of the nine cases of old interstitial keratitis exhibited clinically transparent grafts. Out of thirty cases observed for a period of years, six showed deterioration and one actually improved. With the modified technique now used, it is anticipated that the deterioration of 20 percent of the grafts over a period of years will be considerably reduced. F. M. Crage.

Wille, W. A. *Keratitis ramificata superficialis and its connection with*

asthenopia, blepharospasmus nictitans, and pterygium. *Brit. Jour. Opth.*, 1938, v. 22, Dec., pp. 705-722.

The author believes that this disease has not been discussed in ophthalmic literature although he himself described it in 1914 in a medical periodical in the Dutch East Indies. The disease confines itself to the epithelium. A thin layer of lacrimal fluid which always covers the cornea must be evaporated before the condition is manifest. The specific relationship between this eye disease and pterygium is pointed out and described. The disease is rather common in the tropics, the author having treated many cases in Java, a number of which are described. He regards the disease as due to climatic conditions such as heat, glare, wind, and dust. Some living agent seems to be indicated by the racemose way in which the disease advances. (Case histories, figures, tables.)

D. F. Harbridge.

Zobel, Hans. Sensitivity of the cornea in different periods of life. *Graefe's Arch.*, 1938, v. 139, pts. 4 and 5, pp. 668-676.

For this study, the normal corneae of 261 females and 270 males, together with 54 pathologic cases, were examined as to sensitivity. In the normal cornea, this was found to gradually increase in degree with age, until it attained a maximum between 45 and 50 years. Thereafter, it diminished more rapidly with age to reach a minimum between 80 and 90 years. These changes of sensitiveness are more definite peripherally than centrally in the cornea. The author was able to confirm the fact that the sensibility of the cornea diminished from its center toward the limbus.

H. D. Lamb.

7

UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Alexseev, V. I. Pigment allergy in sympathetic ophthalmia. The significance of the intradermal test. *Viestnik Opht.*, 1938, v. 12, pt. 4, p. 468.

A review of the literature and a tabulated report of intradermal tests of 26 patients with uveitis pigment, prepared by the author. In six cases the cutaneous reaction areas were excised and examined histologically. The intradermal tests were positive in five cases of sympathetic ophthalmia, in two with traumatic iridocyclitis, and in one of recurrent iritis. The reaction was negative in one case of sympathetic ophthalmia and in seventeen cases of traumatism. Pathologically, the excised cutaneous segments had extensive proliferation of cells belonging to the reticulo-endothelial tissues. Of the six cases examined, in five the gross findings agreed with the microscopic. In one case the skin test was clinically negative but microscopically positive.

Ray K. Daily.

Lagrange, H., and Goulesque, J. Iritis and focal infection. *Bull. Soc. Franç. d'Opht.*, 1938, v. 51, p. 334.

This article is practically an abbreviated paraphrase of a previous article on the same subject (see *Amer. Jour. Opth.*, 1938, v. 21, p. 1292).

Okolow-Hryniewiczowa, Z. Sympathetic ophthalmia. A report of three cases of sympathetic ophthalmia with favorable result. *Klinika Oczna*, 1938, v. 16, pt. 5, p. 539.

The local treatment consisted of homatropine, atropine, dionin, and hot fomentations. General treatment consisted in the intravenous administra-

tion of arthrosan (sodium phenylcinchonate and sodium salicylate) auto-hemotherapy, intravenous injections of urotropin, and increasing doses of an antituberculous antigen. The author stresses the fact that sympathetic ophthalmia is not an incurable disease but that treatment must be instituted before irreparable damage has been done. For early diagnosis examination with the slitlamp is indispensable.

Ray K. Daily.

Saburov, G. I. A case of neurofibroma of the upper lid and nodules in the iris in Recklinghausen's disease. *Viestnik Opht.*, 1938, v. 12, pt. 4, p. 557. (See Section 14, Eyelids and lacrimal apparatus.)

8

GLAUCOMA AND OCULAR TENSION

Csillag, Franz. Essential atrophy of the iris and glaucoma. *Klin. M. f. Augenh.*, 1938, v. 101, Dec., p. 874.

Two cases are reported, in which the atrophy arose from the tension and from disturbance of the blood supply of the iris. The glaucoma complicating the iris atrophy was secondary. The tension was lowered by pilocarpine, and even reached normal.

C. Zimmermann.

Greenwood, Allen. Surgery of secondary glaucoma. *Amer. Jour. Surg.*, 1938, v. 42, Oct., pp. 10-13.

In sarcoma of the choroid and in cases of complete obstruction of the central vein of the retina followed by hypertension, enucleation is the only adequate surgical measure. Tuberculin in minimal doses instead of surgery is recommended in tuberculous uveitis. After cataract extraction and contusion and in cases of iritis, medication will

usually hold the tension, but a simple iridectomy may be needed.

Ralph W. Danielson.

Kaminskaja, Z. A., and Gubina, H. M. The diagnostic significance of the Seidel test. *Viestnik Opht.*, 1938, v. 12, pt. 4, p. 479.

The authors' observations demonstrate that Seidel's reaction is reliable only in cases of glaucoma with an active iris sphincter. In absolute glaucoma with iridoplegia the reaction was negative. No relation could be demonstrated between this reaction and dispersion of the iris pigment. The author believes that the increased tension is due to liberation of chemical substances into the aqueous by dilatation of the pupil.

Ray K. Daily.

Kayser, B. May central scotoma with intact peripheral borders or concentric narrowing of the visual field be compatible with a diagnosis of glaucoma? *Klin. M. f. Augenh.*, 1938, v. 101, Dec., p. 883.

The author has reported (see *Amer. Jour. Ophth.*, 1934, v. 17, p. 273) an extreme case of this kind in a woman in whom observation from her fiftieth to her seventy-fifth year had negated a diagnosis of glaucoma. He examined the patient again in her eightieth year. The right disc showed the same excavation of 6 or 7 D., the left from 3 to 4 D. (of glaucomatous character). Vision was 1. The tension was 28 mm. In spite of the development by 1926 of a central scotoma and marked concentric contraction of the visual field as well as the later developments as to tension and excavation of discs, the diagnosis of glaucoma is still rejected.

C. Zimmermann.

Noble, R. L., and Robertson, J. D. The effect of hypertonic solutions on

gastric secretion and intraocular pressure. *Jour. of Physiology*, 1938, v. 93, Sept. 16, p. 430.

In animals where gastric secretion and intraocular pressure have been measured, it has been found that following intravenous injections of 30-percent NaCl 5 c.c. per kg. at the rate of 2 c.c. per minute there was a striking fall in the pressure of the eye and in volume and acidity of gastric juice. Fifty percent glucose had to be given in more than three times the amount and rapidity of the 30-percent NaCl to obtain similar results.

These solutions caused a dilution in hemoglobin which rapidly returned to normal. Intraocular pressure was markedly lowered and remained so for some hours. This was quite independent of the variations in blood pressure. The findings indicate that dialysis is not a satisfactory explanation of the formation of the aqueous humor. A similarity in response to hypertonic solution between gastric secretion and intraocular pressure suggests that a secretory process may play some part in controlling intraocular pressure. F. M. Crage.

Tatár, Josef. Glaucoma in Cushing's disease. *Graefe's Arch.*, 1938, v. 139, pts. 4 and 5, pp. 793-800.

In a 24-year-old farmer's wife with Cushing's disease, there occurred a periodic increase of tension of both eyes with pronounced constriction of the visual fields. This increase of tension was considered to be due to a senilitas praecox as well as to hyperfunction of the adrenal cortex. The considerable contraction of the fields was partly the result of the increased tension but was possibly associated with spastic changes in the retinal arteries.

H. D. Lamb.

9

CRYSTALLINE LENS

Bakker, A. The importance of the iris in the production of infrared cataract. *Graefe's Arch.*, 1938, v. 139, pts. 4 and 5, pp. 667-703.

Rabbit lenses, transplanted to a constant-current tissue-culture, were exposed to rays of an electric incandescent bulb and to those of an arc light. In the genesis of heat cataract, not only the penetrating infrared but also the long-wave infrared rays are important. In both series of experiments the iris played a definitely important part in the production of cataract. A notable specific absorption of the penetrating infrared rays could not be demonstrated for the lens. Infrared rays, after having passed through the entire thickness of a lens without causing the least injury, caused extensive opacities in a second lens covered by its iris. Cataract in the posterior cortex was produced purely by the action of the iris, when all direct rays were excluded. The typical posterior cortical cataract of glass-blowers cannot be the result of direct action of the rays. The so-called specific ultrared cataract of Vogt's experiments is nothing but an ordinary heat cataract.

H. D. Lamb.

Bangerter, A. An unusual case of diabetic cataract. *Ophthalmologica* (formerly *Zeit. f. Augenh.*) 1938, v. 96, Nov., p. 98.

In a child of eleven years, the entire lens of each eye was occupied by fine punctate opacities such as are usually found in the cortex. The planes of optical discontinuity were not visible. This observation does not support the generally held belief that exogenic noxa can only produce superficial lenticular

changes before disintegration of the lens takes place.

F. Herbert Haessler.

Berens, C., and Bogart, D. W. Certain postoperative complications of cataract operations. *Amer. Jour. Surg.*, 1938, v. 42, Oct., pp. 39-61.

Analysis of the results of 1,004 operations and review of the literature. Thirty percent were intracapsular. Preoperative examination and precautions are stressed. (12 figures, 13 tables, 104 references.) Ralph W. Danielson.

Corboy, P. M. A corneoscleral union for cataract operations. *Amer. Jour. Ophth.*, 1939, v. 22, Feb., pp. 174-175.

Podesta, H. H., and Bancke, J. The source of vitamin C in the different tissues of the eye. *Graefe's Arch.*, 1938, v. 139, pts. 4 and 5, pp. 720-731.

Investigation showed that in cattle, horses, and sheep the concentration of vitamin C was increased from the ciliary body and iris through the aqueous humor to the lens. These conditions for vitamin C were found reversed in rabbits, dogs, and guinea pigs. As regards the synthesis of vitamin C, rabbit lenses showed no demonstrable ability, cattle lenses had a strong action, and in guinea-pig lenses it varied according to the extent of the fall of vitamin C from lens to ciliary body and iris, from none to a moderately strong synthetic capacity. H. D. Lamb.

Reiser, K. A. Our experiences with intracapsular cataract extraction. *Klin. M. f. Augenh.*, 1938, v. 101, Nov., p. 692.

At the Bonn eye clinic intracapsular extraction has been used since 1932. The advantages and disadvantages of this method are discussed on the basis

of 300 cases and the results compared with 100 extracapsular extractions. Intracapsular extraction is technically somewhat more difficult. Prolapse of vitreous is more frequent, as well as postoperative iris prolapse. The advantages are: Intracapsular extraction is a single procedure. The physiologic relations (round movable pupil, no adhesions of the pupillary margin) are better preserved. Speedy healing is had without irritation. The visual results are better. In all cases of cataract, except congenital, the intracapsular method was attempted, and it succeeded in 72.2 percent. It should be tried in every case from the minimum age of 40 years, in incipient senile, nuclear, posterior cortical, complicated, and contusion cataract. A contraindication exists in all congenital and acquired cataracts up to the fortieth year of age. C. Zimmermann.

Riad, M. Congenital familial cataract with cholesterin deposits. *Brit. Jour. Ophth.*, 1938, v. 22, Dec., pp. 745-749.

After citations from the literature relative to this hereditary condition, cases are reported. Discussion is based on the history of two half sisters. In the thirteen cases examined, there was no history of consanguinity, nor of mental disturbance or convulsions. Hereditary influence was strongly marked in the females, with continuous descent followed through three generations from an affected female. No constitutional diseases were noted. The author bases his opinion that such cataracts are of congenital origin on the premise that the opacities are seen in the central embryonic nucleus. This is further substantiated by the similarity of all cases and the presence of the condition in both eyes. The type of cataract is fully described. The per-

centage of cholesterol in the blood was diminished according to the findings here presented. (Figures, references.)

D. F. Harbridge.

Salit, P. W. The mineral content of cataractous and sclerosed human lenses. *Graefe's Arch.*, 1938, v. 139, pts. 4 and 5, pp. 654-667.

Altogether 115 cataractous and sclerosed human lenses were analyzed as to the content of potassium, sodium, calcium, chlorine, phosphorus, and sulphur in their ash. The average weight of ash in incipient cataract amounts to 0.921 percent, that in mature cataract 1.067 percent of the moist weight. When one compares this amount with the dry weight and water content, it is found to represent 2.836 percent and 1.392 percent for incipient and 4.010 percent and 1.427 percent for mature cataract respectively. The average content of ash in mature cataract therefore exceeds that of incipient cataract by 16.0 percent, 41.0 percent and 2.5 percent on the basis of the moist weight, the dry weight, and the water content, respectively. The much greater difference in percentage estimated in comparison with the dry weight arises from the small amount of solid substance in mature cataract as compared with that of incipient cataract.

When one compares the total sum of electrolytes by percentage of the dry weight, this increases with advancing stages of cataract and of sclerosis, as a result of the diminution of solid substances in cataractous as well as in sclerosed lenses.

H. D. Lamb.

Urbanek, J. The C-vitamin metabolism of cataract patients. *Klin. M. f. Augenh.*, 1938, v. 101, Nov., p. 670.

In a former article (see *Amer. Jour. Ophth.*, 1938, v. 21, p. 1416), the author showed that in most cases of postoperative hemorrhages in cataract patients a lack of vitamin C could be held responsible. By saturation experiments with vitamin C and by regular administration of vitamin C in cataract patients, postoperative hemorrhage into the anterior chamber was entirely prevented. The author now reports on further tests. Saturation was judged from the quantity of excretion in the urine. The observations are given in tabular form with the following results: (1) The juvenile organism is better provided than the senile with vitamin C. (2) Development of cataract in old people does not always run parallel with a notable C-avitaminosis. There are well nourished cataract patients whose vitamin C condition equals that of the youthful organism. (3) From the fact that the senile organism is poorer in vitamin C one must not conclude that development of cataract is a consequence of C-avitaminosis. (4) The constancy of ascorbic acid in the aqueous, independent of the saturation of the organism, indicates that increase and decrease of vitamin C probably occur more slowly than in the blood serum. (5) The lens is not necessary or responsible for the formation or accumulation of vitamin C in the aqueous. The author's attempts to arrest or clear up incipient opacities of the lens of the second eye in cataract patients showed no satisfactory results.

C. Zimmermann.

Vogt, Alfred. First histologic finding of lens-capsule precipitates. *Klin. M. f. Augenh.*, 1938, v. 100, Nov., p. 703.

Three precipitates on the posterior surface of each cornea in a woman of 76 years, who had had lens-capsule glaucoma in the right eye (enucleated in 1932) are described and illustrated.

C. Zimmermann.

Vogt, Alfred. Further as to clinical course and histology of senile desquamation of the anterior capsule. *Klin. M. f. Augenh.*, 1938, v. 101, Nov., p. 705.

The lamellae projecting into the anterior chamber were observed with the slitlamp for years, and now after death of the patients have been examined anatomically. They show how oval vacuoles in the superficial layers of the capsule pave the way for destruction. The eyeballs were enucleated immediately after death.

C. Zimmermann.

10

RETINA AND VITREOUS

Damel, C. S. Preretinal hemorrhage. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, June, p. 283.

This is a lengthy discourse upon the pathogenesis, evolution, and ophthalmoscopic appearance of preretinal hemorrhages. The historical aspect of the subject is reviewed. The author feels that preretinal hemorrhages may be explained on the basis of venous stasis, this being the case whether the basic cause of the hemorrhage is sclerosis of the retinal vessels, head injury, or periphlebitis. The article is profusely illustrated with fundus photographs and diagrams. Edward P. Burch.

Dubois-Poulsen. The action of hypophyseal extract and adrenalin on the fringes of the pigment epithelium of the frog. *Bull. Soc. d'Ophth. de Paris*, 1937, July, p. 377-380.

The action was found to be the same as that on the skin. Controls were run in sunlight and darkness. Hypophyseal extract caused retraction of the fringes of retinal pigment. Adrenalin caused extension. The author confirms the epidermal origin of the pigment. A similar action may occur in man, in whom adrenalin is known to accelerate dark adaptation. Harmon Brunner.

Grafova, Kornelia. Detachment of the vitreous. *Klinika Oczna*, 1938, v. 16, pt. 5, p. 576.

A tabulated report of the examination of 37 eyes, in 28 of which vitreous detachment was found. The author reviews the literature and concludes from her findings that vitreous detachment does not predispose to retinal detachment but on the contrary prevents it; and that detachment of the vitreous and of the retina are caused by the same pathologic process within the eye. (Illustrations.) Ray K. Daily.

Hofe, K. vom. Changes in the fundus from diabetes. *Graefe's Arch.*, 1938, v. 139, pts. 4 and 5, pp. 801-810.

The most characteristic finding in the fundus from diabetes is the dots of hemorrhage lying superficially and in the deeper layers of the retina. The white foci in the retina are white only when located superficially in the retina. When they lie in the deeper retinal layers, they are more dull and light gray, tinged with yellow or at times greenish. The white foci occur also in arterial hypertension and other diseases. In the majority of patients with diabetic retinal changes an increase of blood pressure exists. Usually, when retinal changes are present, the amount of blood sugar varies between 0.15 and 0.35. Acetone and aceto-acetic acid are frequently absent. An increase of fats

in the blood is generally found in the presence of retinal changes from diabetes. Nevertheless, the lipoid content of the blood is frequently increased when no retinal changes occur. In the majority of cases with diabetic changes in the fundus, the patients are not young and the diabetes has been present more than five years. From the metabolic disturbances in diabetes, there occur injuries to the vessels. The latter lead to nutritional disturbances of the retinal tissue. The white foci represent the reaction of the retina to its disturbed nutrition.

H. D. Lamb.

Kinukawa, C. Two cases of eclamptic retinitis (gravidarum) with pathologico-anatomic findings. Graefe's Arch., 1938, v. 139, pts. 4 and 5, pp. 640-653.

As in albuminuric retinitis, so also in eclamptic retinitis, the inner retinal layers are always normal and entirely free of edematous loosening of the tissue. The changes in the choroidal vascular system, and of the retinal pigmented epithelium, cause the diffuse opacity in the fundus in eclamptic retinitis. The clinical appearance of a so-called glassy retinal edema in eclamptic retinitis is most probably dependent upon a focal collection of subretinal fluid accompanied by no damage to the overlying retina. A change of the retinal pigmented epithelium in eclamptic retinitis, not previously noted, is pronounced pyknosis and atrophy of the nucleus. This indicates here, as in the liver and kidney, rather the injurious action of toxic material than a simple disturbance of nutrition.

H. D. Lamb.

Klemens, F. The presence of cystoid degeneration in the periphery of the retina and its relation to the new-

formed vascular layer. Graefe's Arch., 1938, v. 139, pts. 4 and 5, pp. 743-758.

The formation of hollow spaces in the periphery of the retina occurs at every age. This cystoid degeneration originates and develops independently of the new-formed vascular layer between the pigmented epithelium of the retina and the lamina vitrea, described by Löhlein. The cause of the formation of hollow spaces in the retinal periphery is still not satisfactorily explained.

H. D. Lamb.

Koyanagi, Y. What does integrity of the retinal periphery in albuminuric retinitis indicate? Klin. M. f. Augenh., 1938, v. 101, Dec., p. 844.

The author opposes the theory of Volhard that albuminuric retinitis is due to angiospastic disturbance of nutrition. According to him, integrity of the periphery indicates chiefly a detrimental effect of toxic substances, as there are no known cases of nutritional disturbance of the retina with intact periphery.

C. Zimmermann.

Pischel, D. K. Late results in retinal detachment operations. Amer. Jour. Ophth., 1939, v. 22, Feb., pp. 130-134.

Rumbaur, W. Rare causes of detachment of the retina. (a) lues, (b) flaming nevus. Klin. M. f. Augenh., 1938, v. 101, Dec., p. 866.

The right eye of a woman of 44 years, who denied venereal infection, showed diffuse chemosis caused by episcleritis. At the lower half of the fundus was a large vesicular detachment of the retina covering the disc and the macula. Repeated punctures of this by sclerotomy evacuated subretinal yellow fluid. The Wassermann reaction was positive. Antisyphilitic therapy restored vision to 3/60 with reattachment of the retina.

which was apparently due to transudation of serum from some syphilitic choroidal vessels. A connection with the episcleritis could not be determined with certainty.

An otherwise healthy, robust, non-myopic man of 23 years, upon stooping after strenuous bodily exertion, developed detachment of the left retina, and the eye became blind. After twelve years a detachment of the right retina occurred after similar physical exertion. The patient had an extensive flaming nevus of the whole face, with elephantiasic, proboscis-like thickening of the upper lid and angiomatous vascular changes in the outer tunics of the eye, but not involving the interior. Very probably the cause of the retinal detachment was associated with the nevus flammeus as well as the unusual bodily exertion. C. Zimmermann.

Sakler, B. R. **Retinal detachment.** Amer. Jour. Ophth., 1939, v. 22, Feb., pp. 175-179.

Sobhy Bey, M. **My experiences in retinal disinsertions.** Acta Ophth. Orientalia, 1938, v. 1, Oct., p. 1.

The author reviews the different methods employed for treating disinsertion of the retina at the ora serrata. He is in favor of diathermy but uses catholysis for larger disinsertions. He obtained a perfect cure in four instances out of the eight cases he reports. Disinsertions starting in the nasal and inferior parts have the best prognosis, those in myopic eyes give the worst results. R. Grunfeld.

Sorsby, Arnold. **Vital staining of the retina.** Brit. Jour. Ophth., 1939, v. 23, Jan., pp. 20-24.

First comes a summary of procedures and investigations in this subject dat-

ing back to the sixteenth century. Under the headings of "experimental observations" and "clinical applications" the author presents his findings and technique. The purpose of the article is to demonstrate that the procedure is practicable rather than to show the scope of staining. The fundus appearance in a case of retinal detachment, after intravenous injection of 20 c.c of Kiton fast green V, 10 percent, is shown by a photomicrograph. (References.) D. F. Harbridge.

Tsopelas, B. **Treatment of three cases of occlusion of the central retinal artery with eupaverin Merck.** Klin. M. f. Augenh., 1938, v. 101, Dec., p. 830.

In two out of three cases of nonembolic occlusion of the central retinal artery, the spasmolytic action of intravenous injections of eupaverin seemed to have favored recovery of some vision and visual field. The author is encouraged to continue his attempts with eupaverin in the different types of occlusion of the retinal arteries. He lays the greatest importance on very early use of the drug. C. Zimmermann.

Vogt, Alfred. **Subvascular white precipitates in the detached retina.** Klin. M. f. Augenh., 1938, v. 101, Dec., p. 864.

These white plaques involving large parts of the detached retina are most numerous in the intermediate zone and may cover the vessels. After operative healing of the detachment they disappeared in all of the author's cases. Their histologic basis is still unknown. C. Zimmermann.

Vogt, Alfred. **Symmetric relations of groups of retinal holes to terminal vessels.** Klin. M. f. Augenh., 1938, v. 101, Dec., p. 861.

Vogt has shown that almost all branches of a retinal terminal vessel, may be in relation with holes and grapelike cysts. He now records an emmetropic patient of 50 years in whom these appearances were symmetric in both eyes. The temporal periphery of the left retina presented ten holes, the nasal none. There were some in the temporal region of the right retina. Prophylactically Vogt closed the holes by catholysis and diathermy puncture. Other cases have shown symmetric obliteration of terminal vessels, leading to cystoid degeneration and formation of holes with or without detachment. Many of the author's previously recorded cases of inheritance of retinal detachment illustrated this anatomic predisposition, and the present instance proves such predisposition by symmetric occurrence in the individual.

C. Zimmermann.

Wasserman, I. New ideas on the treatment of retinitis pigmentosa. *Arch. d'Ophth.*, etc., 1938, v. 2, Dec., p. 1088.

In 1935 Lauber described his treatment of tabetic optic atrophy by lowering the intraocular tension and simultaneously elevating the blood pressure. In 1936 he applied the same treatment with apparent improvement in thirteen cases of retinitis pigmentosa. He has repeated this work in eleven cases of retinitis pigmentosa. In most of them he found the intraocular tension to be above normal. Six of his cases were definitely improved in from two to seven months by miotics and measures to elevate the blood pressure (caffeine, strychnine). Improvement of vision was noted in almost all of the cases. Enlargement of the visual field was found in only three cases. Lowering of intraocular tension is easier to obtain

than elevation of blood pressure. (*Bibliography.*)
Derrick Vail.

Wilczek, M. Anomalous vascular supply of the retina. *Klin. M. f. Augenh.*, 1938, v. 101, Dec., p. 841.

The right eye of a man of 43 years, which had been blind for a long time, showed with +8.00 sph. an oval violet disc and very narrow arteries emanating from it. Around it was an irregular yellowish-white avascular area, and around this area were numerous gray foci with pigment. Five large and two small arteries emerged here, supplying a large part of the retina. A greyish strand running into the vitreous represented perhaps a remnant of an atypical accessory hyaloid artery. The lens had been absorbed, leaving a small grayish-white granule adherent to the pupillary margin. The white area seemed to be some sort of aplasia of the choroid, and the whole aspect spoke for a malformation due to disturbed development of the retinal pigment epithelium.

C. Zimmermann.

Wright, W. D. Light adaptation at the fovea for normal eyes. *Brit. Jour. Ophth.*, 1939, v. 23, Jan., pp. 51-66.

Findings of more than one hundred observers are recorded and analyzed, a new model of the subjective photometer being described. The sensitivity of the right eye in relation to the left when both eyes are dark-adapted, the adaptation factor, and the recovery curve are included in the data presented, as well as results as to reaction to glare, as to the photochemical reaction in the retina, and as to adaptation of the method for pathologic investigations. (Figures, references.)

D. F. Harbridge.

11

OPTIC NERVE AND TOXIC
AMBLYOPIAS

Carillo, R., Malbran, J., and Chichilnisky, S. Barbituric retrobulbar neuritis. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, July, p. 370.

In 1937 Zwillinger and Trotot reported a case of retrobulbar neuritis due to veronal intoxication. This case is summarized by the authors, who in addition report the cases of two sisters who suffered from retrobulbar neuritis after ingestion of luminal taken with suicidal intent. The elder sister, who was addicted to the use of luminal suffered a profound systemic reaction, while the younger sister was less affected, although both took the same amount of drug on this occasion.

In each case there were visual disturbances. The elder sister exhibited nerve-head changes and depression of the peripheral field of vision, especially in the vertical isopters of the left eye. There was also a central scotoma with enlargement of the blind spot in this eye. In the right eye the peripheral field exhibited changes similar to those found in the left eye but in lesser degree. The younger sister showed only an enlarged blind spot in one eye.

The authors conclude that if the pressure within the central retinal artery is low, as determined by the method of Bailliart, the prognosis is unfavorable. Intravenous strychnine therapy is indicated for this type of intoxication, and vasodilator drugs may prove a useful adjuvant. Edward P. Burch.

Dimitriou, T. E. The relation of tabetic optic atrophy to changes of general blood pressure and intraocular tension. *Graefe's Arch.*, 1938, v. 139, pts. 4 and 5, pp. 704-719.

The specific degenerative character of tabetic optic atrophy is contrary to any explanation of its changes by purely circulatory damage. The latter is not supported either by the fact that an exceptionally benign course of the atrophy occurs in those cases combined with glaucoma simplex. Hypotony of blood pressure is also absent in many of the cases here cited in the writer's own statistics. For normal nutrition of tissue, it is not the height of the diastolic but the average arterial pressure that is significant. In cases of luetic aortic insufficiency, the diastolic pressure may be very low and the intraocular tension relatively high without papillary atrophy occurring.

H. D. Lamb.

Grolman, Gunther von. Familial pseudo-optic neuritis. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, July, p. 368.

Pseudo-optic neuritis occurred in father and son. Edward P. Burch.

Hartman, E., David, M., and Guillaumat, L. Neurosurgery in certain syphilitic situations with involvement of the optic nerves. *Ann. d'Ocul.*, 1938, v. 175, Dec., pp. 877-893.

Four cases of syphilis of the central nervous system underwent craniotomy for brain tumor with resultant improvement of the involved optic nerves. Two patients with papilledema, one from frontal-lobe gumma, one from gummatous cyst of the fourth ventricle, were relieved of the papilledema with retention of normal vision. The vision in one case of edema of the brain in secondary syphilis was improved from $\frac{1}{3}$ to $\frac{3}{4}$ in each eye by decompression. A tabetic showed improvement in visual fields and acuity after operative re-

removal of adhesions from opticochias-matic arachnoiditis.

John M. McLean.

Sugar, Saul. Papillitis and papilledema in multiple sclerosis. *Amer. Jour. Ophth.*, 1939, v. 22, Feb., pp. 135-139.

12

VISUAL TRACTS AND CENTERS

Cremer, Max. Early amaurosis from diffuse cerebral sclerosis. *Klin. M. f. Augenh.*, 1938, v. 101, Nov., p. 750.

A boy of three years had shown signs of amaurosis for about three months. As the fundi and the pupillary reactions to light were perfectly normal, a process at the calcarine fissure was assumed. Neurologic examination gave negative results. Gradually convulsions and contractions of the limbs and tongue set in, so that the child could take only liquid food. At the age of five years he died. The autopsy revealed a chronic sclerosing process, destruction of all myelin sheaths, fine nuclear fatty degeneration, and perivascular cell infiltrations.

C. Zimmermann.

Custodis, E. Meningioma of the falx; Foster-Kennedy syndrome misleading with regard to localization. *Klin. M. f. Augenh.*, 1938, v. 101, Dec., p. 823.

A man of 41 years complained of frequent headaches since 1933. The right eye showed choked disc with normal vision and visual field. The left eye had vision of 6/60 with absolute scotoma for all colors and relative scotoma for white. The temporal half of the optic disc was pale. Tonic spasm of the facial nerve and paresis of the right abducens developed later. At operation a multicellular meningioma of the falx was removed. It had crowded aside the right frontal lobe of the brain.

C. Zimmermann.

Feigenbaum, Aryeh. Certain responsive bitemporal disturbances of the field of vision (excluding those caused by true tumors of the pituitary body) in some endocrine-vegetative affections. *Acta Ophth. Orientalia*, 1938, v. 1, Oct., p. 28.

Case histories of six female patients are given. They showed a bitemporal disturbance of the field of vision with signs of insufficiency of the pituitary gland but with normal sella turcica. After dehydration therapy the field defects returned to normal. From this the author concluded that the defects were the outcome of swelling of the tissues around the diencephalon, the pituitary body, and the chiasm. The transitory hemianopsic disturbances during pregnancy can be explained upon a similar pathology.

R. Grunfeld.

Friemann, Werner. Rotatory pendulum oscillations, identical with miner's nystagmus, in a tumor of the hypophyseal region. *Klin. M. f. Augenh.*, 1938, v. 101, Dec., p. 848.

A man of forty years complained for three weeks of headache, vertigo, and impairment of sight. Both discs were pale and there was temporal hemianopsia. The roentgenogram showed a widened sella turcica with atrophic dorsum. Roentgen radiation had a good effect on vision. After six months the patient complained of subjective movements and nystagmus when looking upward, but vision had improved to 5/7. The nystagmus disappeared after scopolamine. The observations in this case suggested that damage of the cerebral stem might elicit characteristic pendulum oscillations resembling miner's nystagmus. An inquiry after a year revealed that the oscillations had ceased for several months.

C. Zimmermann.

Löhlein, Walter. **Permanent damage of the visual path in aviation.** *Klin. M. f. Augenh.*, 1938, v. 101, Dec., p. 818.

At an altitude of from 5,000 to 6,000 meters, an aviator suddenly suffered from headache, vertigo, and obscuration of the visual fields. After landing he showed vertigo, nystagmus, and right-sided hemianesthesia and hemianopsia, due to a total scotoma from the macula to 40° in each eye. This persisted at examination after three months. Vision was 4/4. The disturbance was attributed to rupture of a cerebral blood vessel in the visual path above the optic tract, due to circulatory change at high altitude.

C. Zimmermann.

Ohm, J. **Remarks on the article by Friemann (see above).** *Klin. M. f. Augenh.*, 1938, v. 101, Dec., p. 852.

Ohm assumes that in Friemann's case the nystagmus was not caused by the hypophyseal tumor itself or by changes in its immediate neighborhood, but by remote action of a disturbance in the vestibular nuclear apparatus.

C. Zimmermann.

Velhagen, K., Jr. **Indirect heteronymous hemianopsias.** *Klin. M. Augenh.*, 1938, v. 100, Dec., p. 801.

The author shows, on a series of cases, that bitemporal and binasal defects of the visual fields occur as indirect and remote symptoms of processes increasing intracranial pressure which are not located near the chiasm. The question is discussed how far these disturbances of the visual fields may be caused by damage to the sella from increased intracranial pressure. Here hydrocephalus of the third ventricle probably plays the chief part. The possibilities of differential diagnosis be-

tween indirect and direct heteronymous hemianopsias and direct and indirect destruction of the sella are considered.

C. Zimmermann.

13

EYEBALL AND ORBIT

Hay, P. J. **A note on the use of horse-hair sutures for the conjunctiva.** *Brit. Jour. Ophth.*, 1939, v. 23, Jan., pp. 43-44.

The author has found the use of horse-hair sutures useful for closing the wound after inserting the glass globe in a Frost-Lang operation. The advantages are that no knot is needed and there is no bunching of the conjunctiva. The technique is described. (Figures.)

D. F. Harbridge.

Krause, A. C., and Buchanan, D. N. **Dysostosis cranio-facialis (Crouzon).** *Amer. Jour. Ophth.*, 1939, v. 22, Feb., pp. 140-144.

Leydhecker, F. K. **A family with congenital microphthalmos.** *Graefe's Arch.*, 1938, v. 139, pts. 4 and 5, pp. 790-792.

Study of five generations, including 47 members, showed six males and four females affected with microphthalmos. The loss of vision always occurred about the age of forty years.

H. D. Lamb.

14

EYELIDS AND LACRIMAL APPARATUS

Bonnet, P., and Bonamour, G. **Lymphangiectic abscess of upper lid after epilation.** *Bull. Soc. d'Ophth. de Paris*, 1937, July, p. 430.

Of interest because of the custom of plucking the eyebrows.

Harmon Brunner.

Bourguet. Anatomical ablation of the lacrimal sac. *Bull. Soc. Franç. d'Opht.*, 1938, v. 51, pp. 295-298.

The author discusses the anatomy of the lacrimal sac, and describes removal in the capsule, without the capsule, and by a mixed type of operation.

Clarence W. Rainey.

Grandclément, and Bonnet, P. Recurring herpes of the lids, chancriform in type. *Bull. Soc. d'Opht. de Paris*, 1937, July, p. 412.

In a girl of eleven years herpes recurred frequently for several years on the upper lid margin. The lesions swelled and formed pustules and then ulcers with hard raised borders, which took on a brownish color.

Harmon Brunner.

Klikova, O. L., and Tokareva, B. A. The Blaskovics ptosis operation in the Moscow Eye Hospital. *Viestnik Opht.*, 1938, v. 12, pt. 4, p. 495.

Twenty-four operations convince the authors that the Blaskovics operation is the best one for ptosis and is indicated in all cases.

Ray K. Daily.

Kostenko, P. G., and Kopit, P. Z. The pathology of the lacrimal sac in trachoma. *Viestnik Opht.*, 1938, v. 12, pt. 4, p. 505.

A detailed report of the microscopic examination of 33 extirpated lacrimal sacs, nine of which were from cases of trachoma. The authors conclude that the microscopic picture of dacryocystitis in patients with trachoma has no characteristic features. (Photomicrographs.)

Ray K. Daily.

Michail, D., and Zolog, N. New research concerning the action of adrenalin on the lacrimal elimination of

glucose. *Bull. de l'Acad. de Méd. de Roumanie*, 1938, v. 5, no. 4, pp. 607-612.

The injection of adrenalin into the lacrimal gland alone or associated with a subcutaneous injection produces bilateral excretion of glucose in the tears, more apparent on the side on which the gland has been injected. Conjunctival instillation of adrenalin produces hyperglycemia but no lacrimal excretion of glucose, presumably because of reflex inhibition. The ability of adrenalin to cause lacrimal elimination of glucose is decreased in simple glaucoma. This becomes more apparent as the glaucoma approaches the absolute stage.

John C. Long.

Saburov, G. I. A case of neurofibroma of the upper lid and nodules in the iris in Recklinghausen's disease. *Viestnik Opht.*, 1938, v. 12, pt. 4, p. 557.

A report of a case in a thirteen-year-old girl. A Blaskovics operation was performed for ptosis, without cosmetic result. Microscopically, between the epithelial and meibomian glands, the muscle and cartilage excised during the operation showed numbers of horizontal and vertical nerve strands. The enlargement of the nerve strands was caused by proliferation of the perineurium and endoneurium.

Ray K. Daily.

Subileau, J. Twin trephining in dacryorhinostomy. *Bull. Soc. Franç. d'Opht.*, 1938, v. 51, pp. 342-351.

The author modified a trephine instrument used by Arruga, so as to produce twin trephine openings, 9 mm. in diameter, in an operation for dacryorhinostomy. All the osseous surface corresponding to the lacrimal groove is removed, including the anterior and posterior crests. The edges of the bone

are smoothed off with bone forceps. No case reports are given.

Clarence W. Rainey.

Weeks, W. W. Ectropion and entropion of the eyelids. *Amer. Jour. Surg.*, 1938, v. 42, Oct., pp. 78-82.

The author outlines several of the classical procedures for the correction of ectropion and entropion and gives his opinion of each. The illustrations are an outstanding feature of this article. (5 figures, 3 references.)

Ralph W. Danielson.

Wheeler, J. M. The use of the orbicularis palpebrarum muscle in surgery of the eyelids. *Amer. Jour. Surg.*, 1938, v. 42, Oct., pp. 7-9.

The paper describes the use of the orbicularis in correcting congenital absence of the external canthal ligament, ptosis of the upper lid, and spasmodic inversion of the lower lid. (6 figures.)

Ralph W. Danielson.

Zikulenko, K. I. Egg white in ocular surgery. *Viestnik Opht.*, 1938, v. 12, pt. 4, p. 511.

The author substitutes hard-boiled egg-white for mucous membrane from the lip in marginoplastic surgery. His observations lead him to believe that the mucous membrane transplant merely serves as an obstruction to adhesion of the two opposing surfaces, and thus permits ingrowth of connective tissue. He finds that egg white acts as a hemostatic and adheres firmly to the cut surfaces. When the intermarginal area has become filled in with connective tissue the egg white is extruded.

Ray K. Daily.

15

TUMORS

Dupuy-Dutemps, Pierre. Radium therapy of meibomian epitheliomas.

Bull. Soc. Franç. d'Opht., 1938, v. 51, pp. 298-302.

The author reports the favorable results obtained in the treatment of two patients having meibomian epithelioma. The radium caused rapid disappearance of the local lesion, and swelling of the preauricular lymph gland. Surgical removal of the submaxillary lymph glands, followed by more radium, produced apparent cure, after four years observation.

Clarence W. Rainey.

Evans, P. J. Radon treatment of secondary carcinoma of the choroid, post-mortem observations. *Brit. Jour. Opth.*, 1938, v. 22, Dec., pp. 739-745.

This is the subsequent history of a case described by the author in 1937 (see *Amer. Jour. Opth.*, 1938, v. 21, Jan., p. 106), at which time the use of radon seeds in the treatment of secondary carcinoma of the choroid in a woman aged 41 years was reported. In 1937, treatment was being given the remaining eye, the first having been enucleated in January, 1936, for the same condition. During the major portion of the period here covered good vision was maintained, ultimate failure of vision being due to intracranial complications involving the optic nerve. In otherwise hopeless conditions, radon seeds may prove a worthy alternative to removal of the eye. Post-mortem findings are described in detail. (Figures.)

D. F. Harbridge.

Kalt, Marcel, and Tille, H. Symmetric lymphoma of the two semilunar folds, a symptom revealing lymphoid leukemia. *Bull. Soc. Franç. d'Opht.*, 1938, v. 51, pp. 364-372.

A 66-year-old man presented two kidney-bean-sized reddish tumors, one at each semilunar fold. The right tumor mass was removed surgically, and was

found to have the microscopic structure of a lymphoma. Other positive findings in the physical and laboratory examinations indicated leukemia of the chronic lymphoid type.

Clarence W. Rainey.

Koyanagi, Y. Tumor-like proliferation of the retinal pigmented epithelium in metastatic carcinoma of the choroid. *Graefe's Arch.*, 1938, v. 139, pts. 4 and 5, pp. 732-742.

In a man 37 years old, with a primary carcinoma of the right lung, there occurred a metastasis in the choroid of the left eye, just around the optic nerve. Along the under side of the detached retina just internal to the choroidal carcinoma, was observed a membranous formation composed mostly of pigmented cells derived from the retinal pigmented epithelium. Numerous mitotic figures were present among these cells, but no connective tissue.

H. D. Lamb.

Lange, Helmut. Retinal glioma with special consideration of its heredity. *Klin. M. f. Augenh.*, 1938, v. 101, Dec., p. 854.

This is a report on 36 cases of retinal glioma observed in the last 22 years at the Halle eye clinic. Twenty patients, or 44.4 percent, are still living. Of patients with monolateral glioma, 76 percent were cured. The mortality of bilateral glioma is much higher. Tables show beginning of the disease at various ages from one to nine years. The investigations show that retinal glioma may be hereditary. In the hereditary cases it was bilateral. In the clinic glioma occurred in 0.0217 percent of all eye patients. Three cases are described in detail.

C. Zimmermann.

Oribe, M., and Mallbran, J. Anatomical and clinical consideration of retinal

glioma. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, June, p. 319.

The authors present a very comprehensive review of the historical background of retinal glioma, and report five cases. The gross and microscopic appearances of this group of tumors are described in detail, with their clinical behavior. The theories of rosette formation are quite fully discussed and also the analogy between certain tumors of the central nervous system and those occurring in the retina. The authors advance the hypothesis that there are three distinct varieties of retinal glioma. The first is a highly malignant type which they would designate as retinoblastoma and which is held to be analogous to medulloblastoma of the central nervous system. The second type, which is benign, is the retinocytoma. The analogous neoplasm of the nervous system is the astrocytoma. Third, there is a tumor of neuroblastic rather than glial origin. (Illustrated.)

Edward P. Burch.

Paiva, Aroldo. Malignant melanosis of the ciliary body. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, July, p. 363.

A case of malignant melanosarcoma of the ciliary body is reported by the author. After enucleation the sections were subjected to study, but the exact cell type of the neoplasm could not be determined. (Illustrations.)

Edward P. Burch.

Siegert, Peter. Melanosarcoma of the iris. *Graefe's Arch.*, 1938, v. 139, pts. 4 and 5, pp. 591-639.

There are reported three cases of simple sarcoma of the iris in varying stages of development. In the first case, sarcoma cells have developed among the chromatophores of a pigmented nevus of the iris. The remaining two

cases are of flat, malignant pigmented tumors of the iris. In melanosarcoma of the iris, there frequently exists considerable discrepancy between the clinical and anatomic findings of malignancy. Such a growth may develop without producing any symptoms. On the other hand, even where a sarcoma of the iris causes loss of vision from glaucoma, no destructive growth or metastasis may exist. Roentgen raying does not appear to guarantee lasting results. Metastasis of the generally very slowly growing tumor apparently occurs along preformed tissue clefts and perivascular lymph spaces. Sarcoma of the iris may be considered with overwhelming probability to be of mesodermal origin. H. D. Lamb.

Susman, William. Intraocular tumors. *Brit. Jour. Ophth.*, 1938, v. 22, Dec., pp. 722-739.

There are essentially three types of intraocular tumor: retinal tumors of neural origin, sarcomata of the choroid with choroidal differentiation, and melanomata of the choroid. Retinal tumors may be designated as neuro-epithelioma, apolar spongioblastoma, polar spongioblastoma, neuroblastoma, and neurocytoma. Sarcoma of the choroid should be considered as malignant choroidoma. Melanomata are few by comparison and are designated by typical branched melanotic cells. Pigment is not diagnostic of a melanoma, as it may be present in many retinal tumors, its presence merely indicating that the growth has disturbed the choroid. The types of tumor are fully described, and results outlined. (Figures, tables, references.) D. F. Harbridge.

Teulières, M., and Beauvieux, J. Fibroma of the sclerotic. *Arch. d'Ophth.*

etc., 1938, v. 2, Dec., p. 1073; also *Bull. Soc. Franç. d'Ophth.*, 1938, v. 51, p. 372.

Examination of the right eye of a five-year-old boy disclosed a reddish, swollen, indurated roll of tissue occupying the entire cul-de-sac. Vision was 3/10 after the overlying conjunctiva was mobile. The mass was intimately attached to the eyeball (which was proptosed downward over the superior-rectus tendon). It was removed under local anesthesia. Diplopia disappeared and at the end of a few months the vision became normal. Pathologic examination showed a nonmalignant fibroma rich in blood vessels. (Illustration, references.) Derrick Vail.

16

INJURIES

Bruhn, A. M. Clinical and experimental investigations on eye lesions by burr hairs. *Klin. M. f. Augenh.*, 1938, v. 101, Nov., p. 730.

Eight cases of lesions by the pappus hairs of burrs in late summer at the time of maturity and opening of the burr baskets are described. The typical clinical picture consisted of loosening and papillomatous hypertrophy of the conjunctiva, especially the upper fornix, formation of pseudomembranes on the conjunctiva of the upper lid, and erosions and herpetic changes of the cornea. If the burrs remained they caused formation of granulomata. Introduction of burr hairs in the conjunctival sacs of animals produced similar conditions. Injection of oily extracts into the outer layer of the cornea showed no effect, but aqueous extracts produced violent reactions. Hence a chemical poison soluble in water is inferred, supplementing the mechanical irritation.

C. Zimmermann.

NEWS ITEMS

Edited by DR. H. ROMMEL HILDRETH
640 S. Kingshighway, St. Louis

News items should reach the Editor by the twelfth of the month

DEATHS

Dr. Walter Lewis Horn, New York City, died December 29, 1938, aged 47 years.

MISCELLANEOUS

The National Society for the Prevention of Blindness has announced that it is coöperating with the following colleges and universities in offering, at their 1939 summer sessions, courses for the preparation of teachers and supervisors of sight-saving classes:

Western Reserve University, Cleveland, Ohio, June 19th to July 28th. Director of the course, Miss Olive S. Peck, Supervisor, Braille and Sight-Saving Classes, Board of Education, Cleveland, Ohio.

State Teachers College, Buffalo, New York, June 26th to August 4th (dates tentative). Director of the course, Miss Agnes Reuter, Department of Special Education, Buffalo Public Schools, Buffalo, N.Y.

State Teachers College, Milwaukee, Wisconsin, June 26th to August 4th. Director of the course, Miss Marguerite L. Kastrup, Supervisor of Braille and Sight-Saving Classes for Northern Ohio, Cleveland, Ohio.

University of California, Los Angeles, California, June 26th to August 4th. Director of the course, Miss Frances Bland, Principal of Sight-Saving Classes, Los Angeles City Schools, Los Angeles, California.

Wayne University, Detroit, Michigan, June 26th to August 4th (elementary and advanced courses). Director of the elementary course, Mrs. Gladys Dunlop Matlock, Detroit, Michigan. Director of the advanced course, Mrs. Winifred Hathaway, Associate Director, National Society for the Prevention of Blindness, New York, N.Y.

Details regarding the courses may be obtained from the university or college, or from the director in charge of the course.

SOCIETIES

The mid-year meeting of the North Dakota

Academy of Ophthalmology and Otolaryngology was held at Fargo, February 11th. Dr. Avery D. Prangen of the Mayo Clinic, as guest speaker, addressed the group on "Some fundamental problems of refraction."

The Eye Section of the Philadelphia County Medical Society presented the following program on March 2d: The optic atrophy in pituitary disease, by Dr. M. W. Thorner; Pathology of the subchoroida with microscopic projection, by Dr. Perce DeLong.

"The American Physicians' Art Association composed of members in the United States, Canada, and Hawaii, will hold its second Art Exhibit in the City Art Museum of St. Louis, May 15 to 20, 1939, during the annual meeting of the American Medical Association. Art pieces will be accepted for this art show in the following classifications: (1) oils both (a) portrait and (b) landscape; (2) water colors; (3) sculpture; (4) photographic art; (5) etchings; (6) ceramics; (7) pastels; (8) charcoal drawings; (9) book binding; (10) wood carving; (11) metal work (jewelry). Practically all pieces sent in will be accepted. There will be over 60 valuable prize awards. For details of membership in this Association and rules of the Exhibit, kindly write to Max Thoreck, M.D., Sec'y, 850 Irving Park Blvd., Chicago, Ill., or F. H. Redewill, M.D., Pres., 521-536 Flood Bldg., San Francisco, Calif."

The Los Angeles Society of Ophthalmology and Otolaryngology announces the following officers for 1939: President, Dr. Pierre Viola; Vice-President, Dr. Henry B. Lemere; Secretary-Treasurer, Dr. John P. Lordan; Committeeman, Dr. M. N. Beigelman. Meeting place, Los Angeles County Medical Association Building, 1925 Wilshire Blvd., Los Angeles. Time, 6:00 p.m., fourth Monday of each month from September to May, inclusive.

SPASTIC-ENTROPION CORRECTION BY ORBICULARIS
TRANSPLANTATION*JOHN M. WHEELER, M.D.
New York

Many procedures have been suggested for the correction of spastic entropion of the lower eyelid. Most of them depend for their effectiveness on a downward pull, calculated to unroll the inverted lower lid, and, by downward traction, to prevent turning in of the margin. Such pull may be accomplished by the application of adhesive plaster, by the insertion of buried sutures, as suggested by Snellen, Gaillard, Arlt, and others, or by making skin excisions, as proposed by Celsus, von Graefe, Janson, Panas, and many other writers. Skin and subcutaneous-tissue contraction, effected by means of acid and by the application of the actual cautery, has been recommended, and the use of the cautery has been stimulated in recent years by Ziegler's advocacy of his method.¹

Not quite all the procedures for correction of spastic entropion are dependent on methods that induce downward pull on the lower lid. For example, Pochisov² advises canthotomy and severance of the attachment of the outer part of the eyelid to the orbital margin. Goldzieher³ and Blaskovics⁴ removed a triangle of skin from the zygomatic region, and so made lateral traction on the skin of the lower eyelid. Alfred Vogt⁵ suggested a free canthotomy and a readjustment of the

flaps between the outer canthus and the orbital margin, so that during the healing process the lower flap is held forward slightly by the sutures. The result of the maneuver is that the outer part of the lower lid is held slightly away from the globe. In 1929 Valiere Vialeix⁶ advocated excision of the upper part of the epitarsal orbicularis of the lower lid. In 1931 Hughes⁷ described a technique for weakening the action of the orbicularis by the injection of 95-percent alcohol into the muscle near the outer canthus. The use of alcohol has been recommended by other observers. Weekers⁸ found that entropion had recurred in some patients who had received alcohol injection into the lower lid, and hence he advised, for cases in which the condition had existed for some time, a combination of alcohol injection and canthotomy.

I have been unable to find any reference to an operation resembling the one I describe here, unless it be the procedure credited to Birch-Hirschfeld, which is illustrated in the volume on surgery of the eye just published by Blaskovics and Kreiker. In that operation orbicularis strips are dissected up and are tied by sutures that pass through the skin of the eyelid.⁹

In January, 1935, I first performed the following operation:

OPERATION

Anesthesia.—Infiltration of the opera-

*Presented at the Seventy-fourth Annual Meeting of the American Ophthalmological Society at San Francisco, California, June 9-11, 1938.

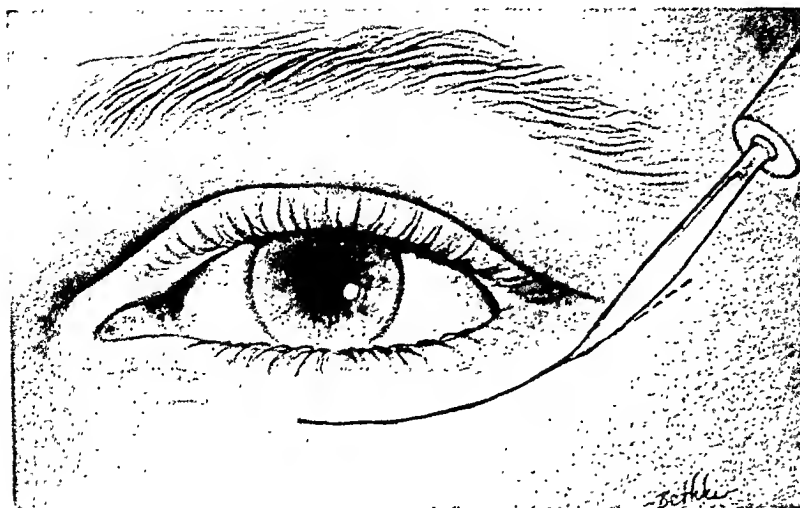


Fig. 1 (Wheeler). Skin incision. For the sake of clarity the lid margin is shown in normal position, instead of in entropion.

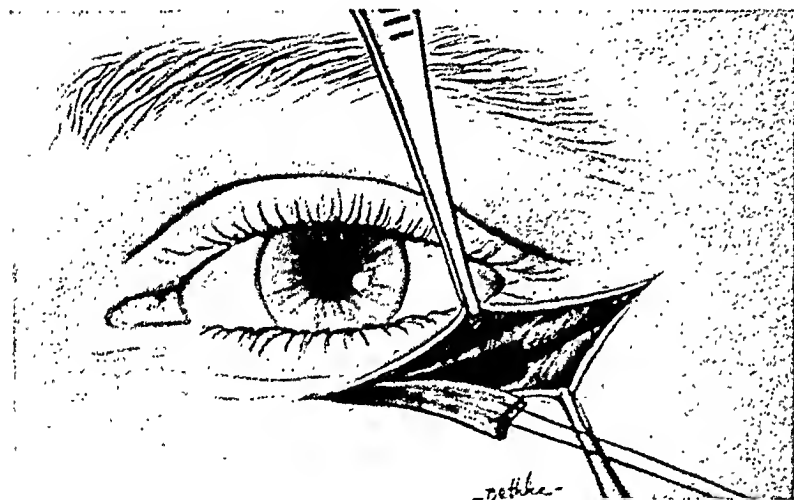


Fig. 2 (Wheeler). A strip of orbicularis muscle about 4 mm. wide is dissected and its free end is held by a suture. The nasal end of the strip is left attached a little below the tarsus. An incision in the orbicularis has been carried over the zygomatic (malar) bone.

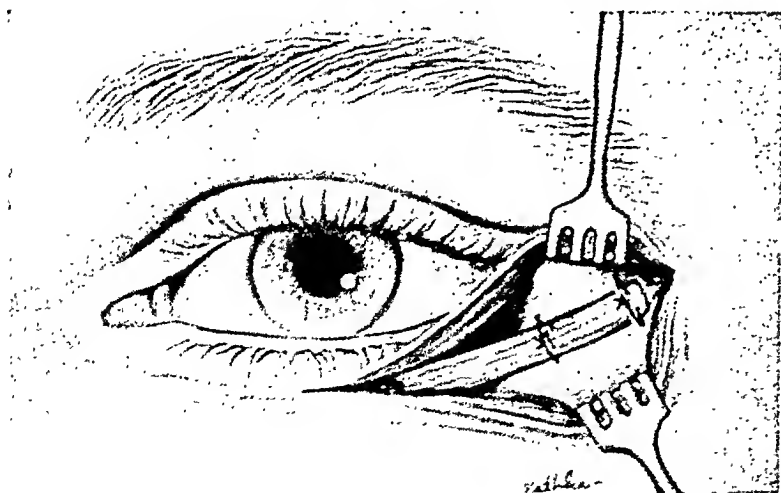


Fig. 3 (Wheeler). Skin and orbicularis flaps are retracted to expose the periosteum, and the strip of orbicularis is attached to the periosteum in its advanced position. The strip is taut.

tive field with a 1-percent solution of novocaine (with or without adrenalin) produces satisfactory anesthesia. The magnification of the tissues that results from infiltration, with increase of the

tissue bulk, makes the dissection easier and enables the surgeon to work with greater accuracy than is possible without infiltration. The injection of fluid into the tissue in front of the tarsus and tarso-

orbital fascia eliminates the entropion, and leaves the lid in good position during the operation.

The primary skin incision is begun about 6 mm. from the lower lid margin, a little nasalward of the center of the eyelid, and is carried in the direction of the lid margin into the zygomatic (malar) region, about 1 cm. beyond the orbital margin (fig. 1). The skin is then dissected from the orbicularis above and below the incision.

A strip of orbicularis muscle about 4 mm. wide is dissected free just below the lower border of the tarsus, with a cut end at the outer orbital margin. This strip is left attached at its nasal end at a point a little beyond the center of the lower lid (fig. 2). Next the orbicularis is divided over the zygomatic (malar) bone by an incision passing outward and upward, and the orbicularis flaps are separated so as to expose the periosteum (fig. 3).

The strip of orbicularis is put on the stretch and attached to the periosteum. It is sutured to its new position by two 000-chromic-catgut sutures, as shown in figure 3. It should be observed that the end of the orbicularis-muscle strip is carried not only temporalward but also upward, and that the muscle strip is thoroughly taut. As the dissection is a little below the tarsus, and so is not attached to it, the lid margin is not pulled much out of place laterally, but the lower lid does receive support.

The skin wound is closed by fine silk sutures, either with interrupted ties or by means of a single subcutaneous suture. I like the security and accurate apposition given by the interrupted sutures, carried through the flaps very near their cut margins.

The eyelids are covered by a protective tissue, such as gutta-percha, with a thin



Fig. 4 (Wheeler). Photograph of a patient who had bilateral spastic entropion of the lower lids. The right lower lid was treated by excision of the skin with orbicularis and repeated cautery punctures. On the left lower lid the orbicularis-strip-advancement operation was performed. Note the lowered position of the right-lower-lid margin, and the normal position of the left-lower-lid margin.

smear of vaseline. A gauze dressing is applied, secured by adhesive plaster, and over this a snug bandage is placed. The dressing should be left on for from five to seven days. After this the skin sutures can be removed and the dressing reapplied, to be left in place for a day or two, by which time the skin wound will have healed, and the transplanted muscle strip be securely adherent to the periosteum.

The result of this procedure is permanent correction of the spastic entropion without appreciable scarring or other disfigurement. The lid is well supported by

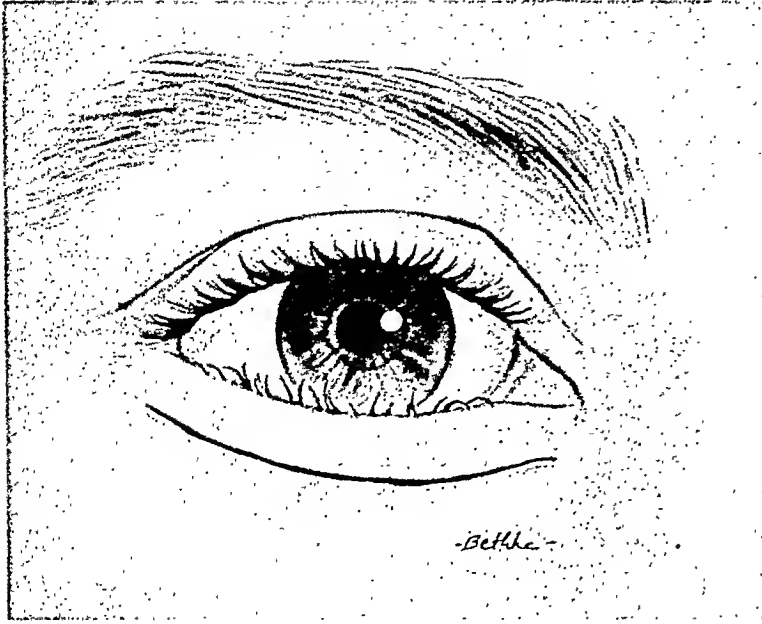


Fig. 5 (Wheeler). Correction of spastic entropion by shortening the orbicularis just below the tarsus of the lower eyelid. Skin incision.

the attachment of the muscle strip, so that the lid margin is in normal position. Such a result is in contrast to that obtained by skin excision, buried sutures, or cautery scars, which usually fail to have a permanent effect and which pull the lower-lid margin downward out of proper place.

Figure 4 shows comparative results in a patient on whom different methods were used for the two lower eyelids. On the right side, skin with orbicularis excision was performed once, and the caut-

ery-puncture procedure was employed four times. Repeated operations were needed on account of recurrences of the spastic entropion. On the left side, the orbicularis-strip advancement was performed. Although the five procedures finally corrected the entropion of the right lower lid, they pulled the lid margin down out of place. On the other hand, the orbicularis advancement not only corrected the entropion in one maneuver but gave the lid margin good support, so that it is at the normal level.

Fig. 6 (Wheeler). Correction of spastic entropion by shortening the orbicularis just below the tarsus of the lower eyelid. The skin is dissected up and the skin flaps are held in retractors. A strip of orbicularis muscle is dissected and held on a strabismus hook.

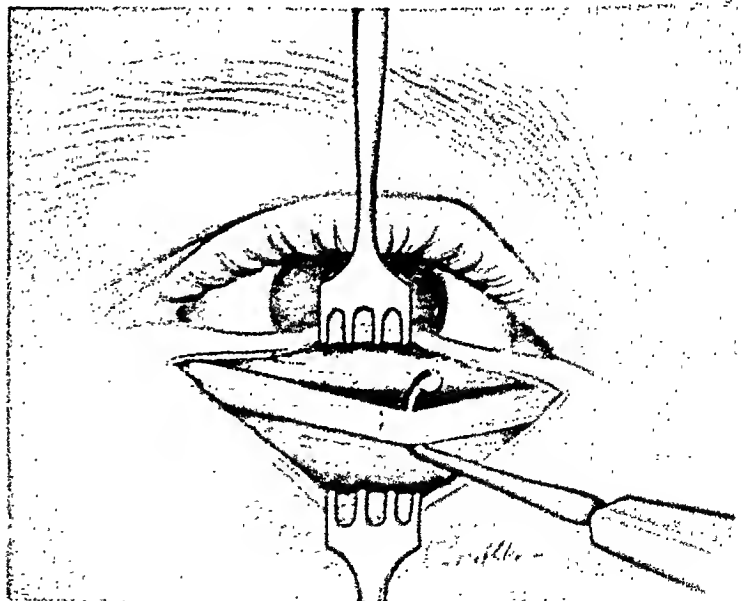
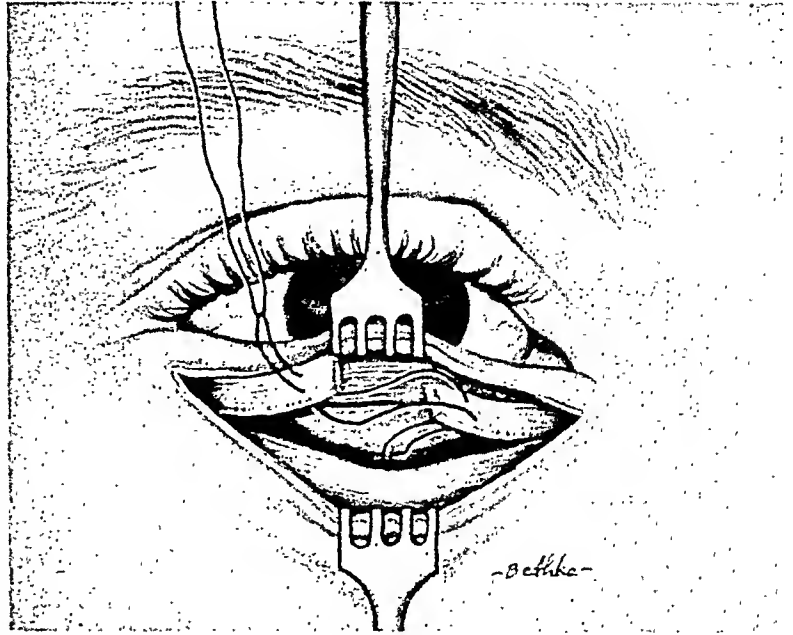


Fig. 7 (Wheeler). A double-armed suture has been carried through the tarso-orbital fascia below the tarsus and through each orbicularis flap 4 mm. from its end.



This operation was performed successfully in several cases and can be thoroughly recommended; nevertheless, about a year ago it occurred to me that a similar result might be obtained in a simpler way, and I offer as a useful alternative the following procedure that I then adopted:

An incision is made in the lower lid, about 5 mm. from the margin, extending nearly the whole length of the lid (fig. 5). Above and below the incision the skin is dissected from the orbicularis, and a

strip of orbicularis muscle 4 mm. wide is dissected up, as shown in figure 6. This strip is taken from the muscle just below the lower border of the tarsus. It is cut in the center, but left attached at the ends. Then a 000 catgut suture is carried through the tarso-orbital fascia about 2 mm. below the tarsus. It is next carried through first one flap of the orbicularis strip and then through the other, so as to force an overlapping of 4 or 5 mm. (fig. 7). The suture is then tied, and the overlapping is made secure by

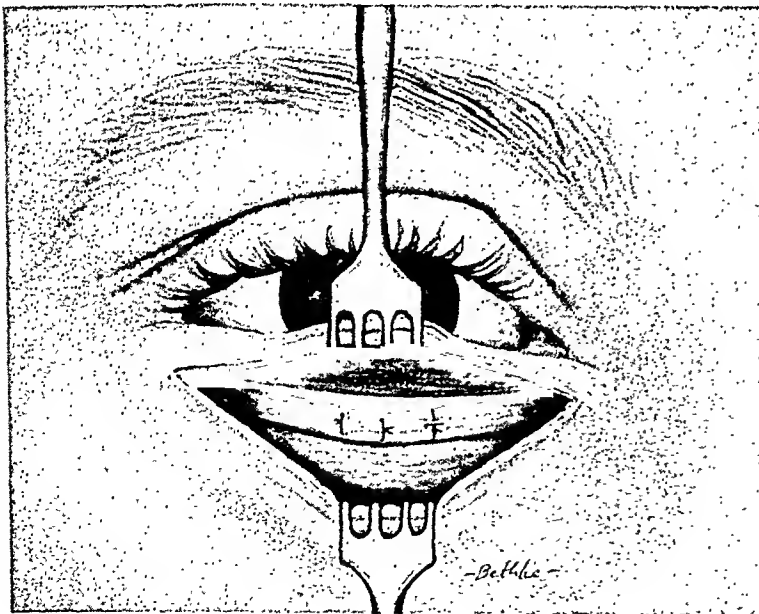


Fig. 8 (Wheeler). The overlapping of the orbicularis flaps is secured by 000-catgut sutures, and the shortened strip is held in position just below the lower border of the tarsus.

two additional catgut sutures, as shown in figure 8. The skin wound is closed and a secure dressing is applied.

With this method the results have been favorable, but in the first two cases in which I operated there was overcorrection as a result of the orbicularis strips causing too much pressure at the border of the tarsus. In these cases the overaction of the operation, with its resultant

ectropion, was corrected by the use of cautery puncture on the conjunctival surface of the lids. After repeated trials I decided that an overlapping of 4 to 5 mm. seemed to be right.

This simple procedure can be recommended, but the operator must bear in mind the possibility of overcorrection or undercorrection.

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DISCUSSION

DR. EDWARD JACKSON, Denver: Dr. Wheeler has introduced us to a somewhat new field of lid surgery. I would like to ask if there is any difficulty in isolating the portion of orbicularis that is required.

DR. JOHN E. WEEKS, Portland, Oregon: I have been very much interested in Dr. Wheeler's description of the operation that he has introduced and have no doubt that the results following this procedure are excellent. For many years I have employed a simple operation for the correction of spasmodic entropion, which is described and illustrated in my treatise, "Diseases of the eye."* Nearly all, if not quite all, cases of spastic entropion exhibit a redundancy of tissue in the lower lid on the side affected. By following the technique that I have described, the redundant tissue is removed, the appearance of the patient is improved, and the entropion is permanently corrected—at least

I have seen no return of entropion in the cases I treated. I have employed multiple puncture by the cautery, the Gaillard suture, and other procedures, but have abandoned them all in favor of the simple operation referred to.

DR. RAMON CASTROVIEJO, New York: Dr. Jackson has asked whether it is difficult to isolate the fibers of the orbicularis in performing Dr. Wheeler's operation for the correction of spastic entropion of the lower eyelid. I should like to answer this question for Dr. Wheeler, since it will be more effective if the answer is given by some one who has not had the wide surgical experience and does not possess the skill of Dr. Wheeler. I have had the opportunity in one case of performing the operation that Dr. Wheeler has illustrated today. I did not find it difficult to isolate the fibers of the orbicularis, and the entropion was permanently corrected.

*Weeks. Diseases of the eye. Philadelphia, Lea and Febiger, 1910, p. 786.

In another case of entropion of the

upper lid I had planned to remove a strip of tarsus, but when novocaine was injected for local anesthesia, the entropion corrected itself. I thought then of Dr. Wheeler's operation for the spastic entropion of the lower lid, and a similar operation was performed on the upper lid of the patient. The entropion in this second case has been permanently corrected. It would be good judgment to keep Dr. Wheeler's operation in mind, since it could be performed in some cases of entropion of the upper lid.

DR. JOHN M. WHEELER, closing: I wish to thank Dr. Jackson, Dr. Weeks, and Dr. Castroviejo for their discussion of the paper. Dr. Castroviejo has partly answered Dr. Jackson's question. I do not know exactly what Dr. Jackson had in mind, but my technique has been something like this: to inject the lower lid

thoroughly with novocaine, so as to secure good magnification of the fibers, and to reduce the entropion while the operation is going on. In the second procedure I spoke of, it is perfectly feasible to clamp the lid so that there will be no hemorrhage. In the dissection one is almost sure to divide the palpebral arteries, and they must be clamped in the dissection. I prefer to leave the orbicularis in place, and with the scissors cut down against the tarsus against which the strips are outlined, and then, lifting the outlined strips with a pair of forceps, cut under with very fine scissors; in this way it is easy, by holding the strip on a hook, to carry on the dissection toward the ends of the lids. The sutures are placed in such a way that one can be sure of the accurate overlapping and the position of the tightened orbicularis strips.

LECTURES ON MOTOR ANOMALIES*

IX. OCULOMOTOR-NERVE PARALYSIS AND OPHTHALMOPLEGIAS

A. BIELSCHOWSKY, M.D.

Hanover, New Hampshire

Palsy of individual muscles governed by the third nerve is rare in comparison with that of the sixth and fourth nerves. One can dispense with a detailed description, since the signs and symptoms and the principles of the diagnostic analysis are to be derived from what has been



Fig. 34 (Bielschowsky). Isolated paralysis of the right inferior oblique muscle. Both eyes can be moved equally up and to the right (A), while in looking up and to the left (B) the right visual line cannot be raised above the horizontal plane.

said about abducens- and trochlear-nerve palsies.

Isolated paresis of the *inferior oblique* muscle is an extremely rare occurrence. The diagnosis of a total paralysis of the muscle as it is shown in figure 34A and B is easily made. In the primary deviation of gaze the paretic eye is deviated downward. In looking down there is no deviation at all and perfect binocular single vision. In supraversion the right eye lags behind. In looking up and to the right the elevation of both eyes is apparently equal, whereas in looking up and to the left the right visual line cannot be raised above the horizontal plane. From this it

must be concluded that the right inferior oblique is totally paralyzed, because that muscle plays the main part in elevating the averted visual line. Figure 35 shows the field of fixation taken by means of after-images. The lighter-dash line represents the limits of the left field of fixation; the heavier-dash line, the limits of the right field of fixation. Both lines almost coincide both in the lower and in the right periphery. The upper limits meet only in the right upper corner. In the left periphery the right visual line cannot be raised even to the horizontal plane. The same behavior is demonstrated by the diplopia test (fig. 36): binocular single vision in the right periphery as well as in the lower half of the field of fixation, except in the left corner of the lower periphery. In the right upper corner there is almost no vertical distance between the double images but a marked obliquity, whereas in the left upper corner they show the maximum degree of vertical divergence, but no obliquity, because the oblique muscles have no influence on the vertical movement of the averted visual line; they have no influence on the position of the meridians—that is, on the torsion movement—while the eye is turned inward. If the patient's head is tilted toward the left shoulder, both the separation and the obliquity of the double images show the maximal degree, while by tilting it in the opposite direction binocular single vision is restored. The lateral separation of the double images is immaterial, because the loss of the averting component of the oblique muscles cannot manifest itself if it is compensated by a nonparetic exophoria.

* From the Dartmouth Eye Institute, Dartmouth Medical School. Read before the Seventh Annual Mid-Winter Clinical Course of the Research Study Club, Los Angeles, California, January, 1938.

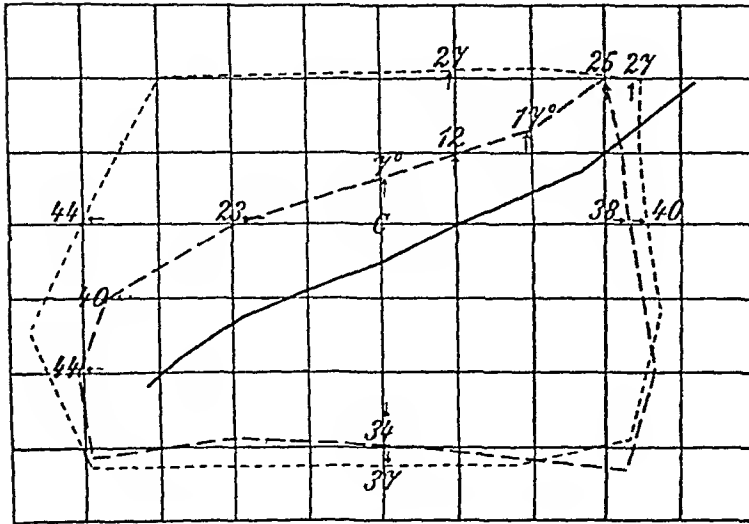


Fig. 35

Fig. 35 (Bielschowsky). Field of fixation taken by means of afterimages in a case of total paralysis of the right inferior oblique muscle. The light-dash line represents the limits of the left field of fixation, the heavy-dash line the limits of the right field of fixation; the unbroken line separates the area of binocular single vision (down and right) from the area in which diplopia exists (up and left).

Fig. 36 (Bielschowsky). Double images of a horizontal object in a paralysis of the right inferior oblique.

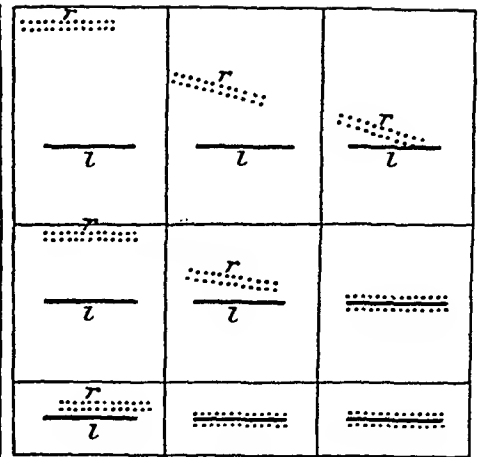


Fig. 36

Isolated paresis of the *superior rectus* muscle is more often met with. In the majority of these cases it is of congenital origin, frequently combined with ptosis. The vertical divergence increases in elevation and in looking to the paretic side, since the superior rectus plays the main part as the elevator of the abverted visual line, which coincides with its muscle plane if the eye is turned out at an angle of 27 degrees. Figure 37 shows the double images in the field of fixation in a paresis

of the left superior rectus muscle. Figure 38A to D demonstrates the deviation in the different positions of the eyes. As a rule, the slight horizontal separation points to the loss of the adverting component, but is immaterial as in all the pareses of vertical motors. The head tilting test does not give such unequivocal clues for the diagnosis as it does in paresis of the oblique muscles.

A habitual position of the head will be met with if it helps the patient to see

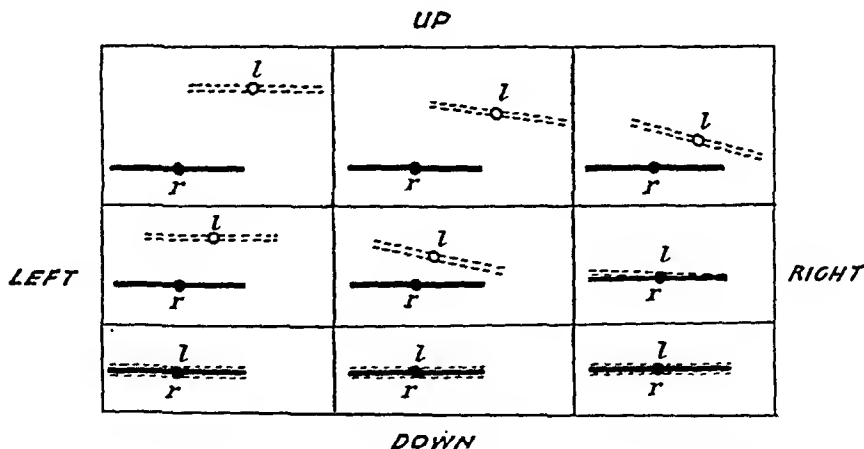


Fig. 37 (Bielschowsky). Double images of a horizontal object in paralysis of the left superior rectus muscle.

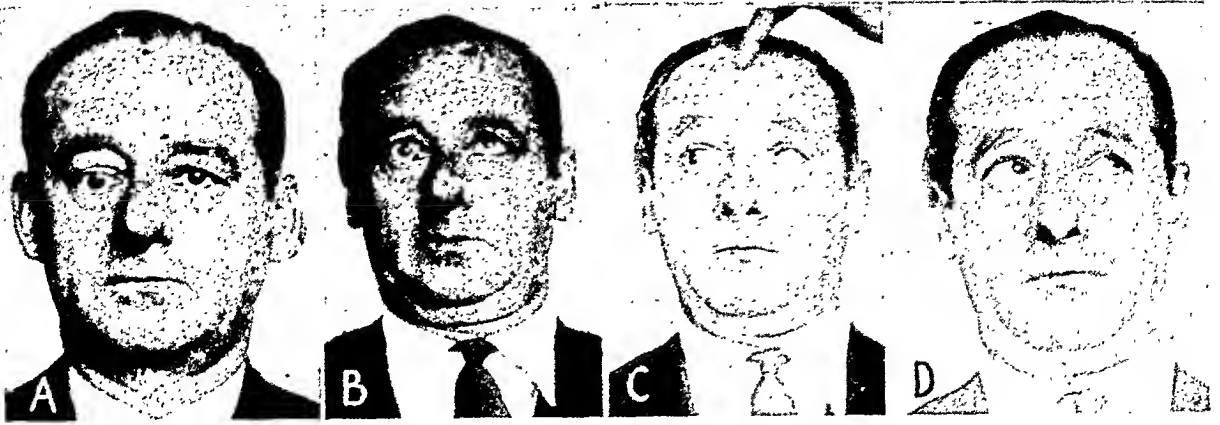


Fig. 38 (Bielschowsky). Paralysis of the right superior rectus. While the left eye is looking straight ahead, the right eye is deviated downward (A). In looking up, the right eye lags behind (B). In looking up and to the right the visual line cannot be raised above the horizontal plane (C). Both eyes are equally moved up and to the left (D).

single. The head is either tilted backward or turned to the paretic side, so that the paretic eye is either turned down or in while an object straight ahead is looked

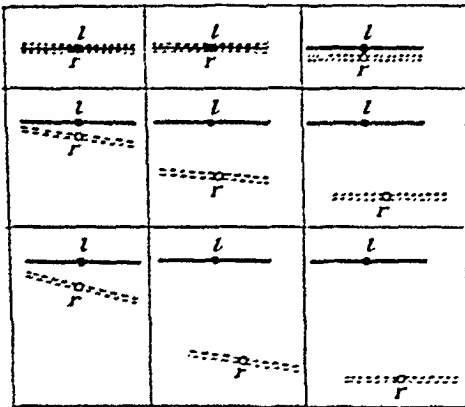


Fig. 39 (Bielschowsky). Double images of a horizontal object in paralysis of the right inferior rectus.

at. Which of these positions is chosen by the patient depends on the intensity of the paresis.

Isolated paresis of the *inferior rectus* is not infrequently due to traumatic lesions of the muscle. Figure 39 shows the double images in a typical paresis of the right inferior rectus. What was said before in the description of pareses of the other vertical motors applies, necessary changes being made, to that of the *inferior rectus*.

Paresis of the *internal rectus* demands special consideration. The internal rectus is the only muscle acting not only in parallel (lateroversion) but also in non-parallel (convergence) movements at the command of the will. Both functions, as well as only one, may be lost according to the site of the lesion. A loss of both functions without paresis of other muscles governed by the third nerve is very rare. Apart from peripheral injuries an isolated paresis of the internal rectus points to a lesion of its nucleus or the roots of its nerve, neither of which can be easily damaged without involving other ganglion cells or other roots of the third nerve. The clinical signs and symptoms of the paresis of the internal rectus show a behavior exactly contrary to that of abducens pareses: A habitual turning of the head toward the sound side; divergent deviation increasing when looking to the sound, decreasing when looking to the other, side; crossed diplopia, and so on. But there is one characteristic which is hardly ever found in any other paresis of a single ocular muscle. Most patients with a paresis or even a complete paralysis of the internal rectus are able to overcome the paretic divergence in the primary direction of gaze by means of a conver-

gence innervation, the only fusion innervation that is governed by the will. That is particularly striking in cases in which the maximum innervation for latero-version fails to turn the paretic eye beyond the middle position toward the nose. But a convergence impulse is able to bring the paretic eye from an extremely divergent into the middle position, so that the parallelism of the visual lines will be restored and a distant object lying in the median plane of the head will be fixated binocularly. This movement of the paretic eye takes place without any coöperation from the paralyzed muscle. According to the law of the reciprocal innervation that was established by Sherrington, the antagonist of a paralyzed muscle—that is, the external rectus—must relax even if the paralyzed internal rectus does not respond to an innervation impulse. Since the divergent position in our case is brought about by the tonus of the external rectus, the eyeball will move after the relaxation of the latter toward its mechanical position of rest; that is, as a rule, to the middle position. Considering the innate association of accommodation and convergence, one would expect an increase of refraction to take place if the paretic divergence is overcome by a voluntary convergence impulse. Indeed, patients with a certain range of accommodation will notice that the outlying objects appear blurred if the divergence is transformed into parallelism by a voluntary impulse. But within a few seconds the vision becomes clear again, due to a relaxation of the accommodative surplus after the fusion tendency has assumed the maintenance of the increased convergence innervation which, as long as it was maintained by the will, was accompanied by a corresponding amount of accommodation.

Paresis of the *levator palpebrae* is rather frequently the earliest and some-

times the sole permanent sign of a lesion of the third nerve. It is easily distinguished from the sympathetic ptosis which, as a part of the Horner syndrome, is combined with a contracted pupil and a slight enophthalmos. Sympathetic ptosis is always incomplete and the pupil cannot be dilated by stimulating the sympathetic dilator iridis with cocaine. Spastic (pseudo-) ptosis, caused by a contraction of the palpebral portion of the orbicularis muscle, may be mistaken for paralytic ptosis, particularly if it is unilateral and not connected with epiphora and photophobia; it occurs as a professional neurosis—for instance, in watchmakers—or as a hysterical sign, or in malingersers. The spastic origin is recognized either by the resistance to the passive raising of the upper lid or by its flickering and trembling movements, moreover by the wrinkles of the skin of the lid, the lower position of the brow, and the raised position of the lower lid.

Voluntary closure of the lids is accompanied, as a rule, by an involuntary upward movement of the eyeballs. The diagnostic value of this so-called Bell's phenomenon will be discussed presently. Under normal conditions the vertical movements of the eyes are associated with the movements of the upper lids, both taking place in the same direction; in looking up the lids are raised, in looking down they are lowered. In exophthalmic goiter this synergy is disturbed rather frequently, inasmuch as the upper lids lag behind while the gaze is being lowered (Graefe's phenomenon). This is due to an increased tonus of the levator palpebrae muscles. We are at present more interested in the disturbances of the synergy, under discussion occurring in the course of oculomotor pareses. A rather frequent and rather striking disturbance is called the pseudo-Graefe phenomenon, because it has a superficial

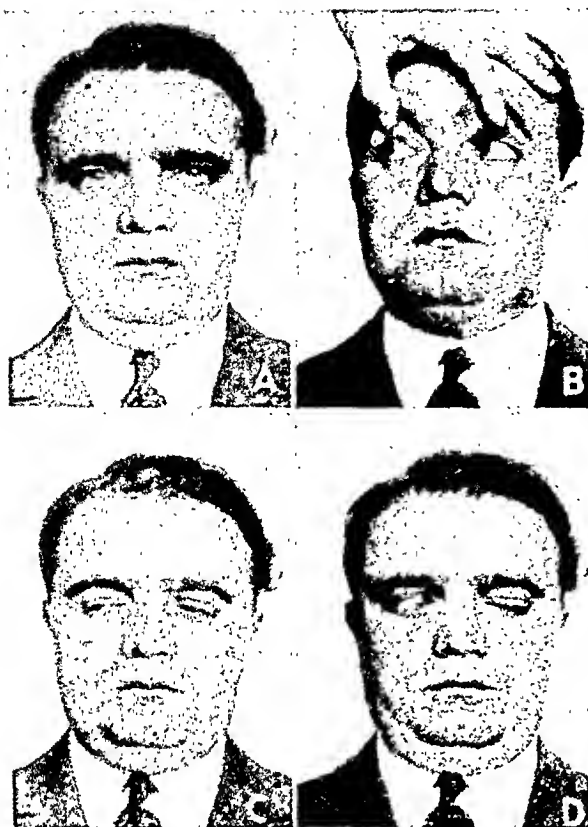


Fig. 40 (Bielschowsky). Pseudo-Graefe phenomenon as a residue of right oculomotor paralysis. A shows a slight anisocoria in the primary position as the only sign of the previous paralysis. B shows considerable dilatation of the pupil of the right eye in dextroversion. C, the upper lids are in equal position in looking down and to the right. D, striking retraction of the upper lid of the right eye (pseudo-Graefe phenomenon) and narrowing of the pupil of the right eye in looking down and to the left.

similarity to the true Graefe's phenomenon. The photographs of some such patients show different types of the phenomenon.

1. A man, 30 years of age, acquired paralysis of the right third nerve through a fracture of the base of the skull. Three months after the accident, I found as the only residues of the paralysis that the right pupil was moderately dilated, the light reaction was reduced to a minimum (fig. 40A to D), the convergence reaction was nearly normal, and there was a slight paresis of the superior rectus muscle. In the primary position the eyes were

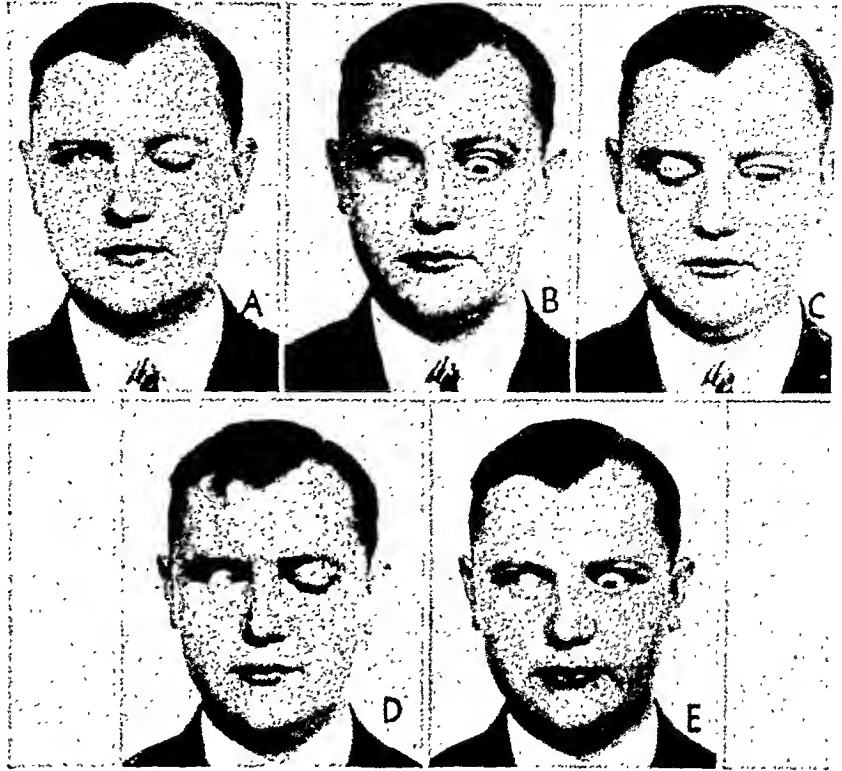
parallel; the upper lids were equally high (fig. 40A). In looking down and to the right both the upper lids accompanied the eyes normally (C), whereas in looking down and to the left the right upper lid was retracted and the right pupil narrowed, so that the anisocoria disappeared (D).

2. A woman, 28 years of age, had total right oculomotor paralysis, the origin of which was not determined. Five months later she presented the signs demonstrated by the photographs (fig. 41A to D). The case differs from the previous one in that the upper lid did not go down at all either in looking down or in looking down and to the right. Probably this difference was due to the fact that the depressor muscles had recovered less in this case than in the others. But a true retraction of the right



Fig. 41 (Bielschowsky). In the primary position (A) dilatation of the pupil of the right eye is the only sign of the previous right oculomotor paralysis. In B and C the right upper lid remains unmoved when the impulse to look down or down and to the right is given. There is striking retraction of the right upper lid while the patient is looking down and to the left (D).

Fig. 42 (Bielschowsky). A shows left oculomotor paralysis, with the left upper lid completely relaxed. In B, a maximum contraction of the left superior oblique prevents the left eye from reacting to the elevation impulse, the left upper lid being raised considerably. In C, maximum innervation of the depressor muscles causes a slight lifting of the upper lid. D shows the levoversion impulse, with complete relaxation of the left upper lid. E shows, as an effect of the dextroversion impulse, maximum retraction of the left upper lid.



upper lid took place only in looking down and to the left. The right pupil behaved exactly as in the other case.

3. A student had total paralysis of the left third nerve as a result of a fracture of the base of the skull. The most inter-

esting sign of the paralysis in its first stage was the enormous contraction of both left depressor muscles, chiefly of the superior oblique, which was especially impressive when the patient was looking up (fig. 42A to E). The left eye appeared stationary, while the right eye was looking straight ahead, to the right, down, or up. Only in looking to the left was there a moderate abversion of the left eye with the same degree of depression.

The patient was under my observation for more than three years. Not until 15 months after the fracture was the first change noticed. In the left upper lid which, hitherto, had been completely relaxed, some folds appeared, and while looking straight forward the patient was unable to lift the lid more than 3 mm. by a maximum effort. On looking to the left

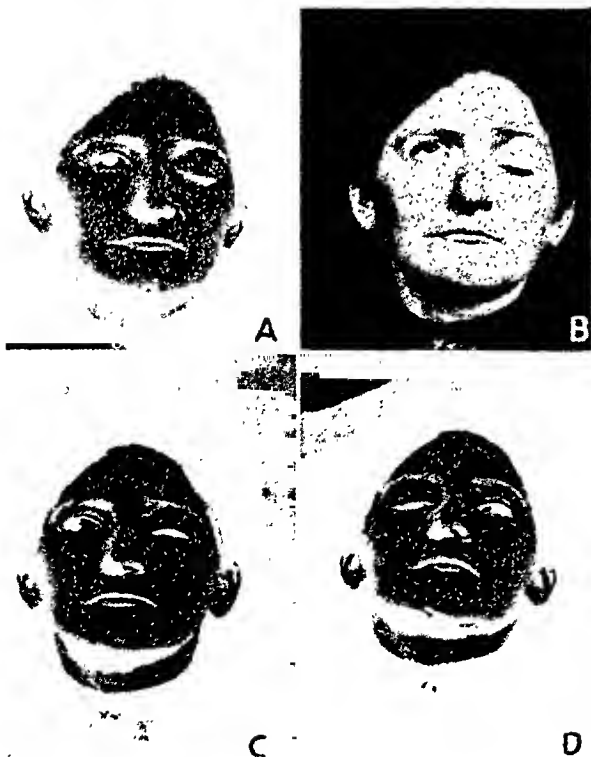


Fig. 43 (Bielschowsky). A shows total left ophthalmoplegia. The elevation impulse does not influence the left upper lid (B). C shows a slight lifting of the upper lid of the left eye in dextroversion. In D, the left upper lid goes up while the patient is looking down (head thrown back).

the lid became completely relaxed and could not be raised at all, whereas when a strong impulse for looking down was given it rose a few millimeters automatically; this retraction was greater when the right eye looked up; a maximum retraction of the left upper lid was found in connection with the impulse to look to the right.

4. A woman, 35 years old, had basal syphilis, which had caused atrophy of the left optic nerve, paralysis of the left fifth nerve, and total left ophthalmoplegia. The left eye was immovable (fig. 43A to D). The left upper lid could not be raised by the strongest effort; it remained relaxed even when the patient looked up (B), but when she looked to the right it rose automatically a little (C), and in looking down it rose still more (D), concurrently with the arrival of the normal right upper lid at its lowest position.

E. Fuchs explained the so-called pseudo-Graefe's phenomenon as follows: Because the third nucleus is injured, or has become atrophic in consequence of a retrograde degeneration, the nervous stimulation sent to a part of the third nucleus extends over the neighboring parts, so that unintended, together with intended, movements are obtained. In my opinion, this theory cannot be reconciled with the following facts: First, there are patients who display the retraction movement of the upper lid in spite of the fact that all the exterior ocular muscles have lost their function completely and the levator palpebrae reacts only automatically to impulses sent to certain other muscles, especially the depressors, which have no physiologic (functional) connections with the levator palpebrae. Further, in nearly all of my patients who showed the phenomenon under discussion the paralysis of the third nerve must have been located at the basis cranii. Either there had been a basal fracture or the

symptoms additional to the third-nerve paralysis necessitated that localization. I cannot imagine a complete retrograde nuclear degeneration, as Fuchs supposed, in which only the nucleus innervating the levator muscle is spared and even this nucleus is not capable of being stimulated voluntarily but responds only to impulses sent to some other atrophic parts of the third nucleus.

I think that the pseudo-Graefe sign can be explained in a less far-fetched manner. Suppose that the continuity of the third nerve is interrupted by a trauma or a tumor. In the course of healing some of the fibers which proceed from the central part of the trunk of the third nerve do not find their original sheaths in the peripheral part of the nerve but go astray, so that they arrive at muscles to which they do not belong. For instance, the fibers from the nucleus intended for the internal rectus arrive not at this muscle but at the levator of the upper lid, so that the impulse for adversion produces lifting of the upper lid, even if it cannot be lifted by a direct innervation effort because the fibers coming from the levator nucleus have gone astray. In some cases a part of the nerve fibers intended for the levator arrive at this muscle together with fibers of a different origin, so that there is no ptosis but an abnormal retraction of the upper lid as soon as an impulse is sent to certain other eye muscles. It seems that the nerve fibers in the course of healing prefer certain "routes" for growing in the wrong sheaths, so that in the majority of cases the impulse to look down and in produces the strongest contraction of the levator of the upper lid.

Another interesting lid phenomenon is the so-called sign of Marcus Gunn, or jaw-winking (fig. 44A to D). In most of these cases there is unilateral congenital ptosis, sometimes combined with paresis of other muscles supplied by the third



Fig. 44 (Bielschowsky). Jaw-winking phenomenon. Congenital ptosis and paralysis of the elevator muscles of the left eye (A). The left upper lid can be raised neither voluntarily nor in looking up (B), but is retracted involuntarily when the mouth is opened (C) or the jaw is moved to the right (D).

nerve, mostly the superior rectus, and in only a few cases is ptosis absent. The photographs show an example of the jaw-winking phenomenon. There is a moderate congenital ptosis of the left upper lid, which can no more be raised by a voluntary innervation of the levator palpebrae than it can in looking up. But if the mouth is opened or the jaw is moved to the right there is a striking involuntary retraction of the left upper lid. It drops down while the jaw is moved to the left. In some cases these unilateral movements of the upper lid are connected with the act of sucking or swallowing. The jaw-winking phenomenon is generally explained by assuming that in such cases the nerves supplying one of the levators originate in that part of the fifth nerve which also supplies the jaw muscles, particularly the external pterygoid muscle.

Without discussing the well-known signs and symptoms of the total paralysis of the third nerve, I would mention only a few unusual and interesting phenomena that occur in some of these cases. Rather frequently there is a marked exophthalmos due to the loss of the retracting component of nearly all the eye muscles. Occasionally one will find a striking retraction movement of the protruding eye

when turned out. That the exophthalmos is responsible for the retraction movement in those cases must be inferred from the fact that both disappear at the same time, while the paralyzed nerve regains its function.

A rare phenomenon, called "nystagmus retractorius" by Körber,¹ who first described it, may be mentioned because of its topical diagnostic value. It has been observed only in cases of grave injury of the nuclear region between the third and the fourth ventricle, either diagnosed by the characteristic paretic signs and symptoms of indubitably nuclear origin or substantiated by autopsy. Elschnig's² case was caused by a cysticercus vesicle in the third ventricle; other cases have been due to tumors of this region. Besides paresis of a few or many muscles of both eyes, the most striking sign is a retraction of one or both eyes following every impulse sent to the ocular muscles. Elschnig has explained this phenomenon as follows: The compression of the whole nuclear region and all its connections, especially the posterior longitudinal bundle, causes disturbance of such kind that every motor innervation not only excites the ganglion cells that are responsible for the intended movement but spreads over the whole nuclear region, thus bringing about the

simultaneous contraction of all the external ocular muscles and the consequent retraction movement.

If the paralyzed eye is constantly fixating because of ametropia or amblyopia of the other eye, the secondary deviation can assume really grotesque forms. Figure 45A to C shows total bilateral oculomotor paralysis with the right eye

a contraction of the latter taking place when the lids are closed forcibly. This peculiar behavior of the pupil, which has been observed even in cases in which the paralysis of the third nerve was due to a lesion of the trunk, has not yet been explained satisfactorily. It would be easily understood by the assumption that the nerve supplying the sphincter iridis



Fig. 45 (Bielschowsky). Total bilateral oculomotor paralysis. Right eye is fixating (A) while the cornea of the left eye is hidden behind the external angle of the palpebral fissure as a consequence of the enormous contraction of the left external rectus (B). The cornea of the left eye is revealed by a strong dextroversion impulse (C).

fixating. The left eye is hidden behind the external angle of the palpebral fissure as a consequence of the enormous contraction of the left external rectus. The cornea of the left eye is revealed only by a strong dextroversion impulse.

In total oculomotor paralysis the pupil is dilated and the reaction to light as well as to the convergence impulse is missing. During recovery the convergence reaction is quite frequently restored earlier than the reaction to light. There are many cases in which, after the exterior muscles have regained their function, the pupil remains more or less dilated while the convergence impulse, though somewhat sluggish as a rule, shows a fairly normal range in contrast to the complete absence of the light reaction which, in quite a number of cases, never returns. In most of them there is also to be found a very striking orbicularis phenomenon of the pupil; that is,

has two roots either of which could be damaged separately. The fibers bringing about the convergence reaction might be more resistant than those responsible for the light reaction, so that they also recover more quickly and more completely. But there is as yet no anatomic proof of such a hypothesis. In some of the cases with the aforementioned pseudo-Graefe phenomenon the involuntary reaction of the upper lid is accompanied by an isolated contraction of the pupil which otherwise showed either normal or a sluggish or no reaction to light at all. This pupillary phenomenon must be explained in the same way as that of the upper lid, by assuming that some of the oculomotor fibers, after the trunk had been interrupted by some lesion or other, do not find their original sheaths in the peripheral part of the nerve but go astray, so that some of the fibers intended either for the internal or the inferior rectus,

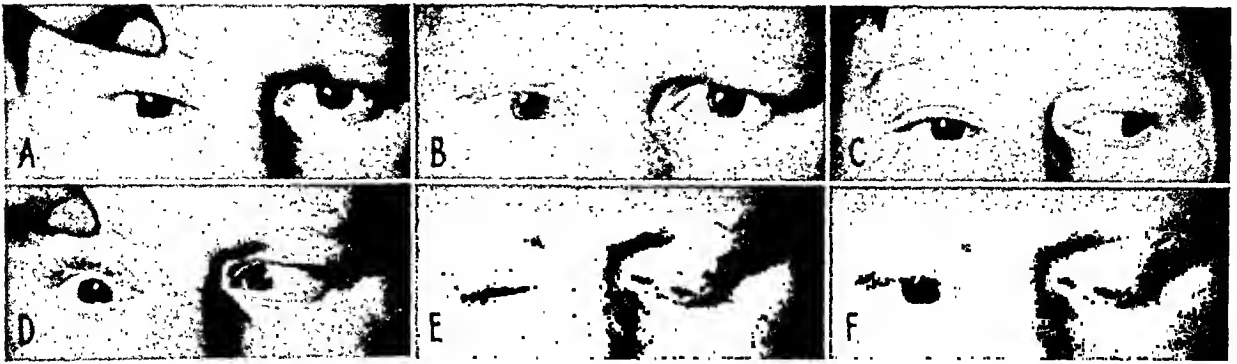


Fig. 46 (Bielschowsky). Cyclic right oculomotor palsy combined with abducens palsy. A shows the paralytic phase: complete ptosis, the pupil of the right eye dilated maximally. During the spastic phase the right palpebral fissure is opened and the pupil of the right eye narrowed maximally (B). The levoversion impulse elicits the spastic phase (C); dextroversion, the paralytic phase (D). Equal position of the upper lids in looking down during the paralytic phase (E); pseudo-Graefe phenomenon during the spastic phase (F).

but arriving at the sphincter iridis, may cause a contraction of the pupil when the patient gives an impulse for in- or downward movement. Very interesting are some observations of total oculomotor paralysis in which all the pupillary reflexes are apparently completely abolished but a prompt contraction of the pupil takes place if an abversion impulse is given, a behavior which points to a congenital anastomosis between the abducens nerve and the ciliary ganglion.

The most peculiar features are presented by the cases of so-called *cyclic oculomotor palsy* (Axenfeld), the principal characteristic of which is the automatic alternation of spastic and paralytic conditions of the paretic eye (fig. 46A to F).

According to his mother the patient was born with normal eyes. When he was one year old the right upper lid gradually drooped. In 1920 he was brought to Uhthoff's clinic, where right oculomotor paralysis and right abducens-nerve paresis were noted and a ptosis operation was performed. I saw the boy eight years later and noted the automatic alternating spastic and paralytic conditions. In the latter phase there was a nearly complete ptosis in spite of the previous operation (A). The right pupil was dilated maxi-

mally and was rigid. When the patient was left to himself staring into vacancy, one could observe after a fraction of a minute a little twitch arising in the paralyzed upper lid, gradually becoming quicker and livelier and finishing with a complete opening of the palpebral fissure. At this moment the right pupil, which before had been dilated, would contract to the minimum size while the left pupil kept its normal size unchanged (B). After 10 or 20 seconds the right upper lid would go down slowly, and at the same time the right pupil would dilate again. This cycle repeated itself at irregular, but mostly very short, intervals all day and all night, provided the patient did not make voluntary eye movements of great extent. The influence of voluntary movements is shown by the subsequent photographs. When the boy was ordered to look to the left during a spastic phase (C), this phase would remain as long as the patient maintained the levoversion. If the order was given during a paralytic phase, this phase would be interrupted after a few seconds and replaced by the spastic phase. The contrary effect was obtained by the antagonistic voluntary innervation. As soon as an impulse for dextroversion was given, the pupil of the right eye would dilate and

the upper lid would droop (D), the condition persisting as long as the boy looked to the right. The last photographs show the position of the right upper lid in looking down during a paralytic (E) and during a spastic (F) phase. The latter gives an impression of the pseudo-Graefe phenomenon.

When I collected the case reports of so-called cyclic oculomotor paralysis, I found altogether 32; having seen 10 cases myself, I am convinced that the condition is not so rare as the small number of published cases would lead one to suppose. There are rudimentary forms of the phenomenon which in the example cited was rather fully developed. Only the pupil of the paralyzed eye has shown the cyclic type of paralysis in all the cases observed by me and reported by others. In one third of the cases the upper lid did not participate in the cyclic phenomenon. Cases in which the internal rectus muscle shared in the cycle are fewer still, and it is exceptional to find the inferior rectus actively involved. The elevator muscles never participate in the alternating spasms and relaxations. So it is easily understood that mild cases, presenting perhaps only the phenomenon of automatically alternating dilation and contraction of the rigid or apparently paralyzed pupil, are overlooked. Some of them have been reported as cases of third-nerve paralysis showing a peculiar pupillary phenomenon. In about 50 percent of the cases the phenomenon is not congenital but acquired in early childhood; in one case it did not appear until the seventeenth year of life. In the majority of cases the paralyzed eye is highly amblyopic or ametropic. As to the localization and the origin of the phenomenon only theories have been advanced. In a former publication² I have discussed the problem at length and have explained why, in my opinion, the lesion must be localized in the region of the third nu-

cleus. Varying vasomotor influences probably play a part in bringing about automatic alternation of spastic and paralytic phases. The interesting influence of voluntary movement impulses in the course of the phenomenon I have tried to explain as follows: A part of the oculomotor nucleus, which has retained but a slight degree of function, seems to react only if it is abundantly supplied with blood. This is obtained when, by sending an impulse to the oculomotor nucleus, the blood vessels in this region are made to dilate; after a short interval the spastic phase arises. On the other hand, an antagonistic impulse going to the abducens nerve of the paralyzed eye seems to cause an inhibition of the oculomotor excitation by the contraction of its blood vessels; the paralytic phase results. The reasons for my theory are given in detail in the publication just mentioned.

Another interesting group of oculomotor palsies comprises cases of *recurrent third-nerve palsies*, frequently called *ophthalmophlegic migraine*, after Charcot. Their main characteristics are as follows: The first attack starts either in childhood or adolescence with severe headaches confined, as a rule, to one side of the head, frequently followed by vomiting. The headaches last a few days, then cease and are followed by a longer or shorter period of perfect well-being. After one or several years an attack of the same kind is followed by a total paralysis of the third nerve which rapidly develops on the side where the headaches are located, one or several days after the onset of the latter. These abate once the paralysis is complete, which outlasts the headaches for some days or weeks but at last subsides completely. After some recurrence of these attacks the third nerve does not regain its normal function but at first paresis, and finally a total oculomotor paralysis remains while the attacks of headaches may stay

away. The sixth and the fourth nerve participate only exceptionally in the aforementioned attacks. As to their origin, the authors are still at variance. While the symptoms in some cases point to a basal lesion, particularly to neoplasms or inflammatory affections in the region of the superior orbital fissure, the cavernous sinus, and the chiasm, numerous observations lead to the assumption that the attacks of ophthalmoplegic migraine are due to spastic disturbances of the blood vessels, which in the course of time may cause an atrophy of the third nucleus.

Besides the recurrent third-nerve paralyses with the symptoms of migraine, there is a much smaller group of recurrent and alternating palsies of the oculomotor apparatus to be met with in tabes, cerebral syphilis, myasthenia, and multiple sclerosis. At one time one muscle group of one eye is affected, at other times this eye may be normal but the same or other muscles of the second eye paretic, or both eyes may be either partially or totally paralyzed. The disease, the nature of which in the absence of other neurological signs cannot always be cleared up, may drag on for many years.

Among the partial oculomotor pareses the cases in which the paresis is confined either to the exterior or to the interior branches of the third nerve are important with regard to their topic diagnostic value. Although lesions of the trunk of the nerve do not always effect a paresis of all the muscles supplied by the third nerve, in general one is warranted in locating a protracted paresis of either the exterior or interior branches of the nerve in the region of the nuclei and the roots, respectively.

OPHTHALMOPLEGIAS

Paresis of several of the motor nerves of the eyes is called ophthalmoplegia. Acute ophthalmoplegias may be due

either to poisoning (by alcohol, lead, botulism) or to acute infectious diseases (diphtheria, epidemic encephalitis, measles, typhoid fever, and allied diseases). In acute hemorrhagic poli-encephalitis due to alcoholism there is a bilateral ophthalmoplegia confined to all the exterior muscles, while the intraocular muscles remain intact. It develops rapidly and the patients die within one or two days. In botulism the intraocular muscles of both eyes are paralyzed, while some of the external muscles are affected in only about 50 percent of the cases. A characteristic of the postdiphtheretic bilateral paralysis of accommodation is the exemption of the pupils. Pareses of extraocular muscles occur in only 1 percent of diphtheria. All kinds of ocular paralyses are met with in epidemic encephalitis: pareses of single muscles as well as unilateral and bilateral ophthalmoplegias, moreover bilateral paresis of accommodation, anomalies of both the size and the reaction of the pupils, even paralyses of the associated movements pointing to supranuclear lesions. Chronic progressive ophthalmoplegias occur not only in the aforementioned diseases of the cerebro-spinal nervous system (tabes, multiple sclerosis, and so on), but as an isolated disease. In many cases a hereditary disposition has been ascertained. During childhood or adolescence the *single extraocular muscles of the two eyes* become paralyzed very gradually in irregular succession. Sometimes in a later stage the intraocular muscles are also involved (fig. 47A to C). The photographs show one of these cases. The boy's eyes were normal until he was six years old. Then a bilateral ptosis developed gradually. He has never noticed diplopia. I saw him when he was 14 and was able to observe the further development until he was 22 years old. The intraocular muscles of both eyes have always remained intact. His head is habitually



Fig. 47 (Bielschowsky). Chronic progressive ophthalmoplegia. Habitual position of the head (A) compensating for the total paralysis of the elevator muscles and maximal secondary contraction of the depressors (B). C shows bilateral ptosis while the head is erect; maximal convergence occurs when the patient receives an impulse for elevation.

tilted backwards, partly because of a total paralysis of the elevators and an enormous secondary contraction of the depressor muscles. When he is asked to look upward there is not the slightest vertical but a maximal convergent movement of the eyes. In striking contrast to the perfectly normal convergence is the complete bilateral deficiency of the adduction movement in parallel lateroversions, a behavior pointing to a supranuclear origin of that deficiency, since the nuclei and nerves supplying the internal recti muscles react normally to the convergence impulse.

This observation leads to a discussion of *internuclear and supranuclear ophthalmoplegias*. As was said before, the internal rectus is the only ocular muscle possessing two functions at the command of the will, one obeying the impulse to a parallel movement of the eyes, the other governed by the convergence impulse. Both functions, as well as only one, may be destroyed, according to where the lesion has taken place. Loss of the convergence function alone is frequent, owing to either functional or organic disturbances. It will be discussed later on. Loss of adduction in parallel lateroversion while convergence is intact is sel-

dom observed. In the majority of these cases there is an associated paralysis of the lateral movement; that is, the external rectus of one eye and the internal rectus of the other eye are paralyzed. Such cases are to be discussed later. The loss of adduction only in conjugate parallel movements while adduction is normal or less impaired in convergence is very interesting and important on account of its value in topical diagnosis. Such a condition can be caused only by a lesion of the posterior longitudinal bundle between the sixth and the third nucleus (*ophthalmoplegia internuclearis anterior*). This lesion, taking place close to the third nucleus, may cause loss of the adversion faculty of either eye in parallel movements, whereas convergence remains intact. The photographs (fig. 48A to C) show a patient with internuclear paralysis of both internal recti, due to a lesion of the posterior longitudinal bundle. The patient had noticed diplopia three weeks before she came to the clinic. Since the function of the internal recti was fully restored after five weeks, the assumption that there had been a slight hemorrhage within the posterior longitudinal bundles seems warranted.

Besides the internal recti there is only



Fig. 48 (Bielschowsky). Ophthalmoplegia internuclearis anterior. Bilateral loss of adduction in lateroversion (A and B); normal adduction in convergence (C).

one pair of muscles, the unilateral paralysis of which can be attributed positively to a supranuclear lesion. Figure 49A to C shows photographs of a patient with apparently total paralysis of the right elevator muscles (A). The right eye was turned far down, while the left looked straight ahead (B). The maximum impulse to look up raised the right visual line only to the horizontal position (B). Vestibular stimulation of the elevator muscles was just as ineffective. But if the patient was asked to close the eyes and the right lids were pulled open, the right eye could be seen to move up perfectly (C). The integrity of the right

elevator muscles in Bell's phenomenon proves that the nuclei of the nerves supplying the right elevator muscles are intact; only their connections with the cortical centers are destroyed. The lesion must be localized close to the nuclei, below the point where the pathway descending from the cortical centers for the elevation of the eyes bifurcates into the branches which go to both the third nuclei. In a later stage of the disease the paralyzed right elevator muscles responded also to vestibular innervation. But the reaction to the voluntary impulse was never restored.

Another patient had an intracranial



Fig. 49 (Bielschowsky). Supranuclear paralysis of the right elevator muscles: right eye deviates downward while the left eye is in the primary position (A). The maximum impulse to look up brings the right visual line only to the horizontal position (B). Normal reaction of the apparently paralyzed right elevator muscles when the patient is asked to close her eyes (C).

tumor with a metastasis in the neck. X rays showed complete destruction of the greater wings of both the sphenoids and of the sella, pointing to a basal lesion. The diagnosis was supported by an almost complete bilateral ophthalmoplegia and bilateral optic atrophy. The only ocular movement that could be performed was depression. The right eye did not respond at all to the elevation impulse, while maximum effort brought the left visual line just a few degrees above the horizontal plane. In view of the apparently unequivocal basal localization of the lesion, the maximum elevation of the left eye that took place in Bell's phe-

nomenon was all the more surprising. It proved that while the right elevators in the last-mentioned test were functioning no more than in all the other tests, the nuclei as well as the nerves supplying the left elevators were intact but cut off from all their supranuclear connections, except the pathway used in Bell's phenomenon, by a part of the tumor extending up to the corpora quadrigemina.

These observations, the only ones which have been published, are important for topical diagnosis. One should never forget to examine whether and how apparently totally paralyzed elevator muscles react in Bell's phenomenon.

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AN INNOCUOUS CLINICAL ENTITY SIMULATING TABES DORSALIS

PUPILLOTONIA WITH ABSENT TENDON REFLEXES (ADIE'S SYNDROME)

JOHN H. BAILEY, M.D., AND EDWARD SASKIN, M.D.
Brooklyn, New York

In August, 1937, H. F., aged 25 years, possessing a sound mind in a sound body, consulted me because he had repeatedly been refused life insurance on the ground that he exhibited metaluetic manifestations. He had large pupils that were immobile to light but reacted to accommodation-convergence; in addition, his ankle and knee jerks were absent. His sister, aged 24 years, in sound health and well poised, presented a similar clinical picture.

In 1902, Strasburger¹ described a hitherto-unknown pupillary anomaly characterized by (1) unilaterality, (2) mydriasis, (3) fixity to light, directly and consensually, and (4) a unique contraction upon convergence. Later in the same year, Saenger² reported several cases that conformed with Strasburger's observations. Saenger believed that the site of the disturbance was in the iridic musculature *per se*, and that the disorder was of the same nature as obtains in myotonia congenita (Thomsen's disease), hence his designation, "myotonic pupillary reaction." The outstanding feature in all these cases was the unusual behavior of the pupil to the stimulus of convergence. Since myotonia congenita and this pupillary abnormality are now regarded as unrelated entities, the term *pupillotonia* is preferred by most writers on the subject; for the striking characteristic of the picture is the sustained contraction or the continued tonicity of the pupil after the stimulus is removed. In 1899, Piltz³ had already noticed that in certain instances, the Westphal-Piltz reflex revealed a pupillary response that is quite similar to that of pupillotonia.

Pupillotonia presents the following features: The phenomena are almost always limited to one side. The affected pupil is wider than its fellow. It is unmistakably dilated, is frequently eccentric and moderately irregular. It is said to be uninfluenced by fatigue, excitement, or the state of health.⁴ When tested in the routine fashion, the pupil does not react to light directly or consensually. When focusing upon a near object, there is no immediate contraction of the pupil; this may give the impression that the pupil is inactive to the accommodation-convergence stimulus. However, as the patient persists in the near gaze, the pupil, after a short interval, starts to contract leisurely but at a progressively diminishing rate until miosis obtains, which may reach an extreme degree. When the patient now looks into the distance, the pupil does not relax immediately; in fact, it may continue to contract still more before commencing to dilate to attain its original diameter, the dilatation being more tardy than the contraction and covering a longer period of time. The delay in both phases of the pupillary response may be considerable. Holmes⁵ reports a case in which 5 minutes elapsed before the pupil contracted upon convergence, and even more time was consumed in its relaxation. Although the photomotor reflex appears to be abolished, that is actually not so, for it can be evoked by a special procedure. If the patient is kept in a dark room about an hour, it will be noticed that the involved pupil is now a little larger than it was previously, and that the fellow pupil approximates it in size. If the eyes are

then suddenly exposed to bright diffuse light, for example, a room flooded with sunlight, the affected pupil, after a short delay, will sluggishly contract to its original size, or may become somewhat smaller; in the latter event, there may be a perceptible interval before the pupil resumes its usual diameter. Not infrequently, corresponding to the persistent contraction of the pupil upon convergence, there is an accompanying spasm of the ciliary muscle, causing an annoying dysfunction of accommodation: the patient sees a near object distinctly, but, upon looking in the distance, his vision is blurred for several seconds or more until the ciliary muscle relaxes. Although the amount of accommodation is increased—that is, the patient can accommodate to a point nearer to his eyes—the range, nevertheless, is greatly diminished or may be practically nil. In one instance, the patient saw the appropriate near type distinctly only at a distance of 15 cm., no nearer and no farther. This disturbance continued about 6 seconds, and it took 50 seconds more before the accommodation resumed its usual flexibility. Reitsch⁶ quotes a case of pupillotonia in which the ciliary spasm lasted an hour, causing a severe headache which was relieved by homatropine. The following data, taken from an article by Behr,⁷ depict a typical example of pupillotonia.

Right pupil (abnormal)

Diameter of pupil, patient facing window, 5.5 mm.
Diameter of pupil, patient's back to window, 6 mm.
Diameter of pupil, three-fourths hr. sojourn dark room, 7 mm.
Diameter of pupil to convergence, 2.5 mm.

(a contraction of 3.5 mm.)

When patient converged to 30 cm., 6 seconds elapsed before pupil responded, remained contracted for 10 seconds after removal of stimulus, and then sluggishly dilated, attaining its normal width in 50 seconds.

Upon focusing at a distance of 30 cm., after an interval of 6 seconds, spasm of accommodation occurred, bringing both the far and near points to a fixed distance of 15 cm., thus extinguishing completely the range of accommodation. This lasted 10 seconds, when the spasm gradually relaxed, and normalcy was reached in 50 seconds.

Westphal-Piltz reflex, exaggerated.

Pupillotonia may digress from the norm. The following deviations have been noted: (1) The pupil does not maintain a uniform dilatation; it may vary in size even in the course of the examination, although only to a moderate degree. (2) The light reflex cannot be elicited in spite of the most painstaking effort. (3) The reaction to convergence offers nothing unusual except for a slow dilatation upon removal of the stimulus; or the reaction may be typical on one occasion and perfectly normal at other times. (4) The pupil is absolutely immobile to light and to convergence. (5) The previously tonic pupil may become subsequently totally fixed, having ceased to react to light and to convergence; and, conversely, a fixed pupil may exhibit later on characteristic tonic phenomena. (6) Bilaterality, though very rare, yet strangely present in the two cases reported herein. (7) Both pupils show one or more of the variations enumerated above, or one pupil is typically tonic and the other manifests these variations.

Cases of iridoplegia and ophthalmoplegia interna totalis (so-called fixed pupils), whose origin is unknown, are regarded by Adie⁸ as aberrant forms of pupillotonia.

In pupillotonia, the pupil contracts promptly and vigorously to pilocarpine, eserine, and cholin preparations. Cocaine

Left pupil (normal)

2.5 mm.
3 mm.
6 mm.
2 mm.
(0.5 mm.)

Pupil reacted promptly upon convergence and dilated just as promptly upon removal of stimulus.

Accommodation act and range, normal.

Normal.

and atropine produce the usual dilatation; and if adrenalin is now added, further dilatation (maximal mydriasis) takes place.

An important associated sign is loss of the deep reflexes. As a rule, the reflexes are absent on both sides; exceptions, however, are not uncommon. Some of these reflexes may be missing on one side, and different ones missing on the opposite side. The reflexes most frequently affected are the ankle jerks, then the knee jerks and arm jerks.

Adie⁹ divides pupillotonia into (1) complete forms and (2) incomplete forms. The latter are subdivided into (a) tonic pupils alone, (b) atypical phases of tonic pupil alone, (c) atypical phases of tonic pupil with absence of the deep reflexes, and (d) absence of deep reflexes alone.

Pupillotonia, when accompanied by the loss of deep reflexes, suggests to the attending physician tabes dorsalis, and such cases have been subjected to prolonged antiluetic treatment, to the mental and financial distress of the unfortunate patient. The tonic pupil is naturally mistaken for the Argyll Robertson pupil. A careful analysis will readily establish the differential diagnosis. In the first place, the Argyll Robertson pupil is only exceptionally unilateral, in which case the affected pupil is the smaller one; while in pupillotonia, the affected pupil is always larger than its fellow. As a rule, in pupillotonia the pupil is less irregular than is the Argyll Robertson pupil. The Argyll Robertson pupil is refractory to the light stimulus under all circumstances, and it will not dilate upon a long sojourn in the dark. It responds promptly to accommodation-convergence, and dilates as promptly when the stimulus is removed. Atropine does not produce a maximal dilatation, and cocaine is altogether ineffectual; in pupillotonia these drugs exhibit their full action. When the photomotor reaction is

absent in pupillotonia, subcutaneous injection of strychnia will provoke a definite though feeble response, or will augment it, if it is weak; this does not occur with the Argyll Robertson pupil. In a miotic Argyll Robertson pupil, the psychosensory dilator response is apt to be subnormal. Two opposing factors normally participate in this reflex, a sympathetic and a parasympathetic. A sympathetic stimulus is sent, via the cilio-spinal center and the cervical sympathetic, to the dilator iridis, causing this muscle to contract; and a parasympathetic stimulus is transmitted simultaneously, via the third nerve, to the sphincter iridis to cause it to relax, each stimulus producing, on its own account, a widening of the pupil. In the Argyll Robertson pupil, the sympathetic element is likely to be impaired, owing to spinal-cord involvement; this would reduce the psycho-sensory effect. In pupillotonia, the psycho-sensory reflex is normal. The Westphal-Piltz phenomenon shows nothing unusual in the presence of the Argyll Robertson pupil, but in pupillotonia the reaction may assume a tonic character. In pupillotonia, the pupil may vary in size and performance during the examination; the Argyll Robertson pupil does not behave in such manner. Cases of pupillotonia that have been observed for years, have at no time displayed any evidence of syphilitic infection; there were no familial nor degenerative stigmata, the blood and spinal fluid were repeatedly negative, visual fields and eye grounds normal, there was no palsy of the extrinsic ocular muscles, and the general skeletal musculature was unaffected. Accordingly, the writer agrees with Bramwell¹⁰ *et al.*, that pupillotonia is a clinical entity of an innocent and innocuous nature. Syphilis of the nervous system that does not manifest, at any time, any signs or symptoms except pupillotonia and absent tendon reflexes, does not exist. Moore¹¹ reported under the

caption "Non-luetic Argyll Robertson pupil" a series of cases that doubtless belongs to the category of pupillotonia. In passing, one might mention the neurotonic pupillary reaction, a photomotor phenomenon analogous to the convergence reaction in pupillotonia. The cause of the neurotonic pupil and its explanation are obscure.

Instances of atypical pupillotonia have been diagnosed as the ocular sequelae of diphtheria. In diphtheria, there is usually the history of a specific infection, the ophthalmoplegia interna is commonly bilateral, and frequently limited to paralysis of the ciliary muscle, the symptoms appear a few weeks after the acute course has subsided, and, as a rule, there is a comparatively early complete recovery. The peculiar response of the pupil to convergence is absent. In addition, the pupil contracts to the near reflex to a less extent than normally, assuming that the innervation of the sphincter iridis is intact. In this connection, it may not be amiss to call attention to the physiology of the near reflex. When a person focuses upon a near object, there is a distinct contraction of the pupil caused by the acts of accommodation and convergence. In paralysis of accommodation alone, the pupil will still contract, although to a less extent. The same holds true in paralysis of convergence alone, as may occur in encephalitis lethargica. In paralysis of both accommodation and convergence, the near reflex is completely abolished. Thus the amount of contraction of the pupil to the near reflex is the sum of the contraction due to the accommodation plus that due to the convergence.

A case of diabetes may unexpectedly reveal absent knee jerks and pupils that do not react to light but do react to the near reflex. Such a case may be accompanied by some of the features of atypical pupillotonia.

Since pupillotonia appears in the standard textbooks under the title "The myotonic pupillary reaction," it seems pertinent to state briefly wherein it differs from those myopathies that are characterized by myotonic phenomena, particularly myotonia congenita or Thomsen's disease. In the various myotonic disorders, only the striped or voluntary muscles are involved, while in pupillotonia, the disturbed function affects smooth muscle. A patient afflicted with myotonia congenita has no difficulty in initiating any movement; there is no delay or latent period, contrary to what occurs in pupillotonia. It is true that in the myotonias, once the muscles contract, they remain in a spastic condition for some time; for example, when the eyes are closed, they can be opened only slowly and after the expenditure of much effort. Frequent repetition of the act causes a temporary recession of the disturbance. In pupillotonia repetition does not ameliorate the dysfunction. The pharmacologic test is of value. Quinine produces an immediate and spectacular, though short-lived, subsidence of the symptoms in myotonia congenita, but is inert in pupillotonia. In the myotonias, the deep reflexes are preserved and pupillary changes are uncommon. Conversely, in pupillotonia there is no involvement of the skeletal muscles. In the myotonias, the muscles themselves or their myo-neural junction is at fault; in pupillotonia, the anomaly is based upon a distant factor. In myotonia atrophica, presenile cataract is a frequent occurrence and may direct attention to the diagnosis of the myopathy. A pronounced sleepy look, owing to a drooping of the upper lid, is characteristic.

Adie's statement that pupillotonia is a disease *sui generis* is disputed by those who contend that cases of pupillotonia should be divided into two distinct groups: (1) pupillotonia appearing as the sole clinical manifestation in a healthy

individual, (2) pupillotonia as part of a general morbid state. It is to the first group, that the eponym "Adie's syndrome" may appropriately be applied, although much credit accrues to Behr for his thorough study of the subject, whose brilliant contributions were published 10 years before those of Adie. Pupillotonia has been reported in encephalitis lethargica, migraine, diphtheria, chronic alcoholism, contusion of the eyeball, cranial injuries, and herpes zoster ophthalmicus. Patients presenting Adie's syndrome in the above restricted sense, are mostly young females in good health with loss of the deep reflexes; while in the other group, there is no sex preference, areflexia is not a part of the clinical picture, and there is a recognizable extraocular disease in addition to the pupillary anomaly.

Regarding the etiology, pathology, and pathogenesis of pupillotonia, we have no definite knowledge; our views, at best, are merely speculative. Some believe that a neurotropic virus is the offending agent, others hold the view that a neurosis or a psychosis is at the bottom of the trouble, still others implicate the endocrines.

As to the site of the pathological process, again opinions differ. Saenger thought the muscles of the iris were primarily involved—that is, that the lesion was of a myopathic nature—a view that has few adherents. Many¹² are inclined to ascribe the disorder to a disturbance in certain parts of the third-nerve-nucleus district or cerebrad thereto. They hold that the vegetative nervous system sending impulses to the respective muscles via the parasympathetic is responsible for the disturbance. In about one third of the cases¹³ there is additional evidence that the vegetative nervous system is implicated: vasomotor instability, and anomalies of perspiration and of skin temperature. Loss of deep reflexes has been observed in catalepsy, narcolepsy, family

periodic paralysis, myasthenia gravis, the myopathies, Graves's disease, and other affections, conditions in which there is apparently no organic change in the reflex apparatus. Respecting the *modus operandi* of pupillotonia, Behr theorizes as follows: In the domain of the nucleus of the third nerve are parasympathetic cell groups that subserve accommodation and the photomotor and near reflexes. These cells have become or are inherently sluggish in action, and when stimulated there is no immediate response, the energy of the stimulus being stored up or accumulated in the cells. This energy is then slowly discharged, even after the stimulus is removed, thus accounting for the peculiar behavior of the pupil. There is a perversion of function, not due to any organic lesion, but rather dependent upon an abnormal physico-chemical change in nerve tissue.

The view that pupillotonia is a result of emotional instability, that it is of psychotic origin, or a neurosis, will not explain that the anomaly is unilateral, that it occurs in persons in sound physical and mental health, and that it persists, as a rule, unaltered over years of observation.

The following is a summary of the cases of two patients who have been under my care since August, 1937.

H. F., a white male, in good health, had a negative history. He had high myopia; his corrected vision, O.U. was 20/20. Ocular excursions were normal, as were also the visual fields and eye grounds. The right pupil was irregularly oval, the left pupil pear-shaped. In good daylight, the right pupil measured 3 mm. in diameter, the left 4 mm. Neither pupil reacted to light directly or consensually when examined in the usual way. However, after a sojourn of one-half hour in the dark room, the right pupil was 5 mm. wide, the left 4½ mm. Upon focus at 8 cm., after a latent period of 3 seconds, the right pupil contracted slowly to 2 mm.,

and then when the gaze was directed to distance, dilated leisurely, consuming 60 seconds before attaining its former size. The left pupil required 3 seconds to elapse before it responded to accommodation-convergence, contracted to $2\frac{1}{2}$ mm., and remained thus contracted for 6 seconds after the removal of the stimulus, reaching full dilatation in 28 seconds. There was no associated accommodative spasm. The Westphal-Piltz and psychosensory reflexes were normal. In the course of the examination, the pupils would vary appreciably in size without any apparent reason. The tendon reflexes were absent.

I. F., a sister of H. F., 24 years old, unmarried, had a negative history. She also had a high myopia, and corrected vision was 20/20. Both pupils were dilated, the right to a greater degree. They were moderately irregular and eccentric; there were no synechiae. Neither pupil reacted to light directly or consensually, even after a prolonged stay in the dark. Typical tonic convergence reaction proved the pupils slow to respond; they remained contracted after removal of the stimulus, and then slowly dilated. Ankle and knee jerks were absent.

855 Saint Marks Avenue.

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SYPHILITIC OPTICOGHIASMATIC ARACHNOIDITIS*

DERRICK VAIL, M.D.

Cincinnati

Basilar meningitis due to syphilis has been recognized for many years. Oppenheim, in 1911, stated that—"The chief form of brain syphilis is basal gummatous meningitis. It usually arises from the sub-arachnoid tissue in the region of the chiasma, from the space between the cerebral peduncles, and thence it extends more or less widely in a diffuse, although irregular, manner over the base of the brain. At some points, and often over a wide extent, it forms a firm, connective-tissue induration, which adheres firmly to the basal parts of the brain. It penetrates into all the bifurcations and depressions, and spreads like a veil over the origin of the cranial nerves. . . . The basal meningitic process may also be limited to a small area, *e.g.*, to the neighborhood of the oculomotor nerve, the chiasma, etc." The chiasm and other cranial nerves are bathed in cerebrospinal fluid as they traverse the various cisterns of the brain, the most important, from our viewpoint, being the cisterna chiasmatica and the cisterna interpeduncularis. The access thus provided for infection to reach the cranial nerves explains the early incidence of cranial-nerve palsies in the course of basilar meningitis. In addition to the nerves, innumerable blood vessels range through the cistern and thus carry the infective agent into the cerebrospinal fluid at these points. Gravity and cisternal stasis perhaps play a role in localizing the process at various areas. This would explain the predilection of the infective agent for the base of the brain and posterior fossa, the latter particularly from middle-ear disease.

It is well known that syphilis has a tendency to involve the crevices and folds of the central nervous system (Friedman, Brock, and Denker). The changes consist of an inflammatory exudation into the meninges, in which spirochetes are found, but especially in focal accumulations of cells in the meninges, particularly in the walls of blood vessels and in the adjacent substance of the brain itself (MacCallum).

Igersheimer (1918) terms the region of the optic chiasm the "Lieblingsitz," or "favorite seat," of basal syphilis, and discusses chiasmatic syphilis at great length. When other cranial nerves are involved, it is not difficult to recognize syphilitic basilar meningitis, but when the optic nerves and chiasm alone are implicated, the arachnoid nature of the syndrome of atrophy of the optic nerve and visual-field defects is frequently unsuspected or is mistaken for parenchymatous syphilis, that is, *tabes dorsalis*, as Hausman has pointed out. When all other chiasmal lesions—for example, (1) intrasellar lesions, (2) suprasellar lesions, and (3) parasellar lesions, including aneurysm of the circle of Willis, tumor of the optic chiasm or optic nerve, traumatic lesion of the optic chiasm, oxycephaly, and heredodegeneration—have been excluded, the underlying cause is arachnoiditis. Just as the nonsyphilitic cases of chiasmal arachnoiditis have shown improvement or recovery by surgical intervention, so arachnoiditis due to syphilis has yielded to surgery, with, in a few cases, improvement of vision. Modern neuro-surgery has revealed many lesions the nature of which has hitherto been entirely unsuspected. Among these is opticochiasmatic arachnoiditis. The nonsyphilitic form has been extensively studied, notably by Craig and

* Read at the Seventy-fourth Annual Meeting of the American Ophthalmological Society, at San Francisco, California, June 9-11, 1938.

Lillie, Heuer and Vail, Davidson, and especially by French investigators. A recent monograph on the subject by Bollack, David, and Puech analyzes at great length 129 surgically verified cases, and forms an exceedingly valuable contribution to the subject. Thirteen, or 10 per cent, of these collected cases had positive blood and/or spinal-fluid Wassermann tests. Adhesions due to arachnoiditis involving the chiasm were found at operation, in all cases, and were freed as thoroughly as possible. It is pertinent here to analyze the postoperative visual result in these cases. Six showed no improvement; three became somewhat worse as time went on. All these cases, so far as preoperative vision was concerned, were practically hopeless. The postoperative result was considered good in two cases, the vision improving in one eye from zero to 1/50 in one case and from 5/7 to 5/5 in the other. Two cases showed slight visual improvement (from shadows to 1/100, and from 1/35 to 1/25). One case remained unchanged (5/50 both eyes). In one patient the postoperative visual result was not stated, and one patient died following operation. These results are not, to be sure, very encouraging, but the unfavorable outcome, as has been pointed out, occurred in patients in whom the optic nerves were very much atrophied, and in whom prognosis for recovery of useful vision could be regarded as positively hopeless.

Hausman has recently reported five cases of syphilitic arachnoiditis of the optic chiasm. One patient (case 1), a Negress, aged 26 years, had suffered severe intermittent headaches for four years, bilateral anosmia for three years, and progressive loss of vision for two years. There was almost complete blindness in the left eye, temporal hemianopia in the right eye, and bilateral primary atrophy of the optic nerve. The Wasser-

mann reaction of the blood was 4+, and of the cerebrospinal fluid was negative. X-ray examination showed a shallow sella, with poorly outlined clinoid processes. Craniotomy with liberation of chiasmal adhesions was performed. Prompt improvement in the visual fields resulted, and one month after operation the vision had steadily improved in both eyes. Three patients were not operated upon, and intensive antisyphilitic treatment was of little benefit, only one case showing slight improvement. One patient died a year after coming under observation and treatment. Autopsy revealed a gumma of the right parietal lobe, and perichiasmal syphilitic plastic meningitis. Microscopically there was gummatous meningitis of the optic chiasm.

Bollack, David, and Puech believe that in certain cases the realm of opticochiasmatic arachnoiditis can be extended to include tabes. In other words, a tabetic person can have arachnoiditis. These observers quote Mme. Schiff-Wertheimer as follows: "We have seen that the meningitic lesion is not sufficient to explain the pathologic process that affects the nerve trunk. On the other hand, we have insisted on the frequent beginning of the lesions at the periphery of the nerve and believe that section of the meninges and the resultant drainage can have a favorable influence."

Recent studies by Greenfield and Epstein indicate that they corroborate the findings of Schiff-Wertheimer, Stargardt, Behr, and Igersheimer that chronic meningeal inflammation is the cause of tabetic optic atrophy. It was found that the superficial fibers in the optic nerve were affected first, that the myelin was affected more than the nerve fibers, and that inflammatory changes in the meninges were much more evident in the intracranial than in the intraorbital portion of the optic nerves.

David, Hartmann, and Hebert reported the case of a tabetic male, aged 48 years. In 1936 his vision, especially in the right eye, began to fail rapidly. The field of vision showed marked loss in the lower portion. The vision in the right eye was reduced to 2/10; in the left eye, to 3/10. Blood Wassermann and Kahn tests were strongly positive. Bilateral optic atrophy was present. Antiluetic treatment was administered, but six months later the fields of vision showed still further loss. Craniotomy and exposure of the chi-

asma revealed a widespread leptomeningitis extending over the entire frontal lobe. There were large white sheets of scar tissue on the sylvian fissure. The right optic nerve was concealed by an enormous white-banded sheet of tissue, suggesting a cystic membrane, from beneath which a large amount of fluid exuded. The optic nerves were freed carefully. Two months after the operation the vision in the right eye was 3/10; in the left eye, 5/10. The field of vision had improved.

Fasiani reported a case of tabes in which arachnoidal adhesions around the optic nerves were found and freed. (The details of this case are not available.) On the other hand, Sourdille and David reported a tabetic case in which operation did not disclose any arachnoidal adhesions. The two optic nerves were small, reddish gray, and were the seat of inflammation and atrophy. There was no basilar meningitis, but an enormous amount of fluid escaped from the chiasmal

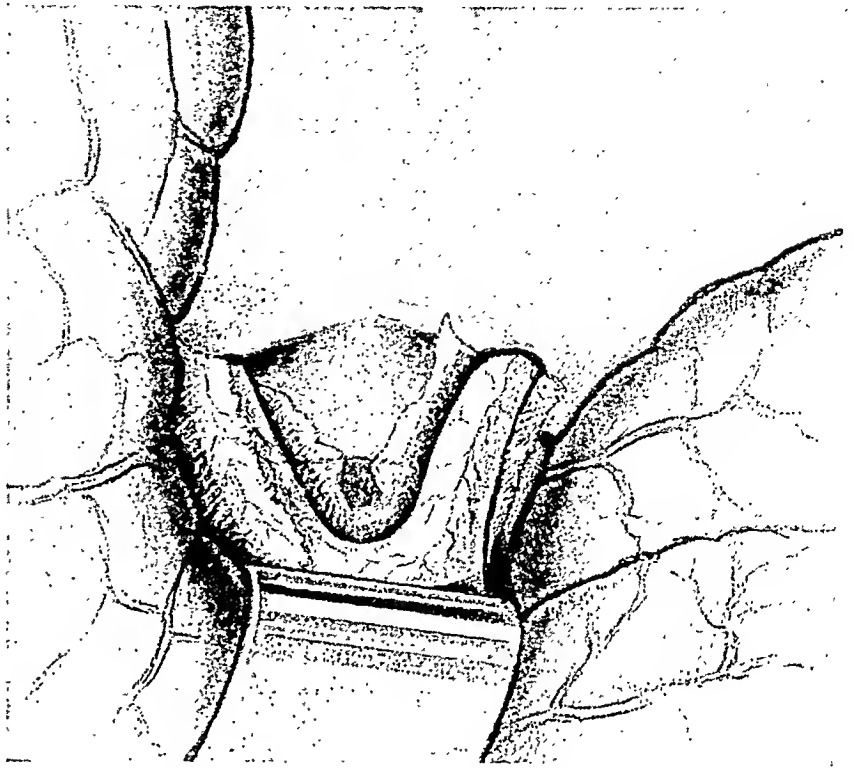


Fig. 1 (Vail). Exposure of right optic nerve (case 1).

cistern. There was no postoperative improvement of vision, but, strange to say, the patient's ataxia improved remarkably, a fact that the authors cannot explain. The fields of vision were not typical of a chiasmal lesion, showing concentric contraction only.

CASE REPORTS

Case 1. W. F., white, male, aged 58 years, was first examined on March 2, 1938. He complained of poor vision, especially in the right eye, for at least five years, and probably longer. In November, 1930, he had struck the right part of his head, immediately after which he noticed that the vision in the right eye was poor. The left eye was normal at this time. He consulted an optician, who referred him to an ophthalmologist. Glasses were prescribed. At this time the vision in the left eye was normal, but no cause for the poor vision in the right eye was given. In 1933 he was seen by another ophthalmologist, who found primary optic atro-

phy in both eyes and diagnosed the condition as tabes. The pupils were moderately dilated and did not react to light nor consensually. Both discs were pale, but the right especially so. On August 29, 1933, the vision was: R.E., no light perception; L.E., 15/15, and J.6 with a +2.50 D. sph. added, indicating that there was probably a relative central scotoma. Wassermann was 2+; Kahn, 4+. Mer-

ferred severe headaches. At the General Hospital in 1935 he was given malarial treatment. He believed that his vision improved, or at least that it remained stationary for a time. Then it became steadily worse in the left eye until, on March 22, 1938, the vision in the left eye had been decreased to the ability to count fingers at three feet.

Examination: The right pupil was



Fig. 2 (Vail). Fragment of arachnoid membrane removed at operation (case 1).

curial ointment and intravenous salvarsan medication were prescribed.

A year later the blood Wassermann was 4+. The vision in the left eye was reduced to 15/50, and a large central scotoma was found which the ophthalmologist believed was the result of the salvarsan injections. June 21, 1934, inhalations of amyl nitrite were given, the vision being 15/24 after the second inhalation and 15/19 after the third. Hypodermic injections of sulphuric oil and amyl-nitrite inhalations were prescribed during July and August, 1934. The final vision in the left eye was 15/19. The patient was not seen again until February 4, 1935, when the vision in the left eye had been reduced to 15/200. Unfortunately, the ophthalmologist had misplaced his fields of vision in this case. The patient reported that following the medication, particularly after the intravenous injections, he suf-

fered severe headaches. At the General Hospital in 1935 he was given malarial treatment. He believed that his vision improved, or at least that it remained stationary for a time. Then it became steadily worse in the left eye until, on March 22, 1938, the vision in the left eye had been decreased to the ability to count fingers at three feet.

Examination: The right pupil was semidilated, did not react to light, but did react to accommodation. Ophthalmoscopic examination revealed the presence of a mixed type of optic atrophy: The outline of the nerve head was sharp, the blood vessels were markedly reduced, the lamina cribrosa was visible, and the color of the nerve head was a pale whitish green. In view of the patient's history, and what can be considered as adequate antiluetic treatment, a diagnosis of opticochiasmatic arachnoiditis was made, and the patient was referred to Dr. Howard McIntyre, a neurologist, who confirmed the diagnosis and advised craniotomy. On April 4th this was performed by Drs. Nolan Carter and Joseph Evans at the Good Samaritan Hospital. A right frontal lobe exposure was made, and an excellent view of the chiasm and the optic nerves was obtained. The cortex of the brain was covered with a thin, plastic membrane, which was

patchy and irregular.

Old exudate was deposited along the great vessels. The exposure of the chiasm revealed (fig. 1) a thin membrane, not unlike filter paper, covering the optic chiasm and the blood vessels. A piece of this membrane was removed for biopsy. An examination of the pathologic specimen revealed the presence of a thickened arachnoid with epithelioid cells and secondary fibrosis (fig. 2). The adhesions were much thicker and more numerous on the left optic nerve. In fact, on the

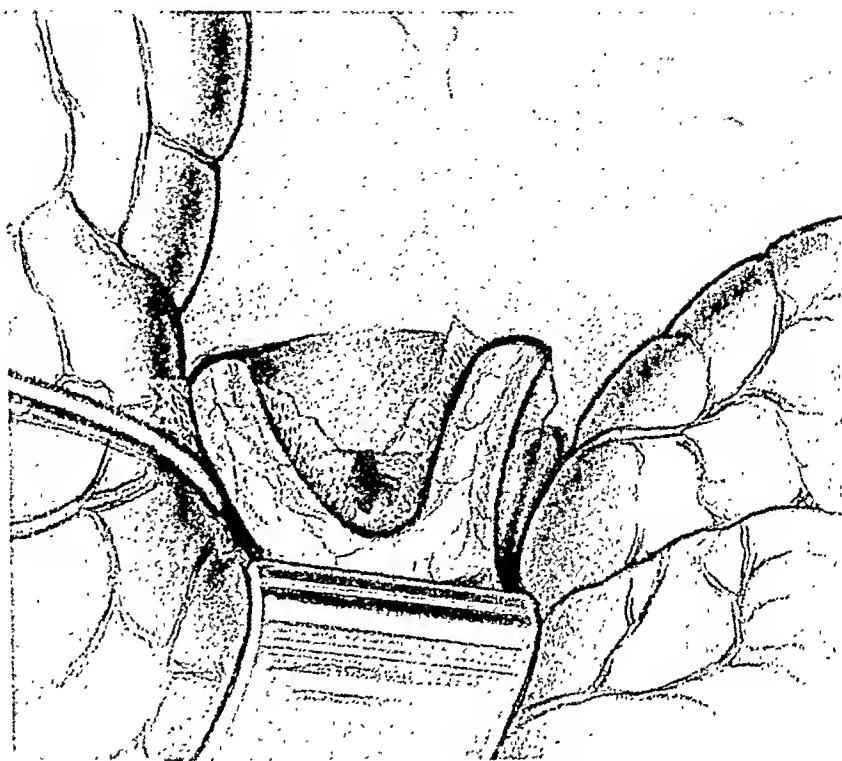


Fig. 3 (Vail). Exposure of left optic nerve (case 1).

first exposure of the left optic nerve it was thought that the nerve was shrunk to a thin thread, but careful dissection disclosed that this appearance was due to the membrane infringing on three fourths of the width of the nerve, to such an extent that the rest of the nerve was not visible. This membrane was resected and pushed back out of the way, revealing a normal-sized optic nerve (fig. 3) that was a little paler than usual. There was some flattening of the optic

nerves as they entered the optic foramen. A large amount of clear fluid was evacuated from the cisterna chiasmatica.

The first few days after the operation were stormy, and because of secondary hemorrhage, the bone flap was elevated and a blood clot removed. After that the patient showed a steady improvement. The examination of the optic-nerve heads two days after operation showed no change. Apparently the vision had not changed either. On May 18, 1938, the

right eye had no light perception, but with the left eye the patient could count fingers at 10 feet. There was good light projection in all parts of the field, especially in the temporal field, but doubtful in the center. The patient's wife stated that she had noticed a decided improvement in his ability to go about the house, although he did not think his vision had improved much, if any. The field of vision was as seen in figure 4.

Case 2. F. B., white, male,

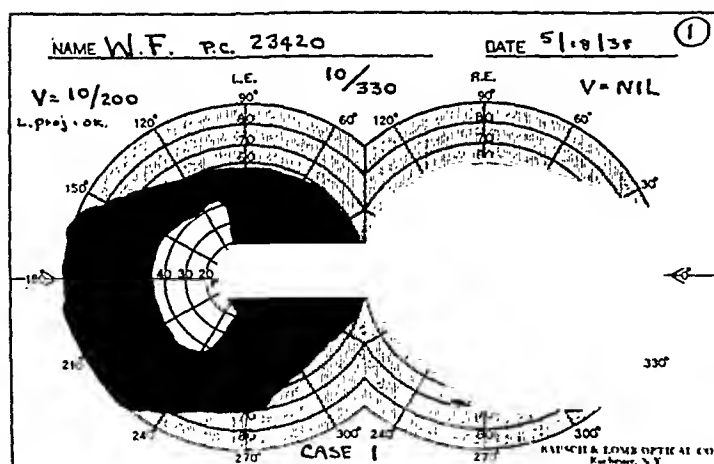


Fig. 4 (Vail). Field of vision (W. F., case 1).

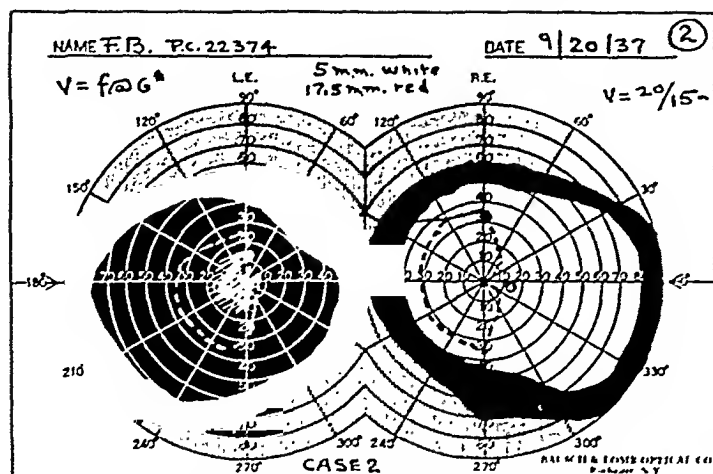


Fig. 5 (Vail). Field of vision (F. B., case 2).

aged 35 years, a salesman, was first examined on September 20, 1937, when he gave a history that the vision in the left eye had become poor one month previously. Everything seemed to be blurred, and vision gradually grew worse, so that he was no longer able to read with the left eye. There was no history of any inflammation or injury. His general health had always been considered good. He denied venereal infection.

Examination: Vision in the right eye was 20/15—1, and J.1; the eyeball was free of congestion, the pupil was of normal size and reacted somewhat sluggishly to light. The vitreous was clear; the optic-nerve head was sharply defined. The latter was very pale, with a visible lamina cribrosa and deep physiologic cupping.

The vessels were somewhat constricted. With the left eye the patient counted fingers at six feet. The left pupil did not respond to light or accommodation. The disc outline was sharply defined, with deep physiologic cupping. The nerve head was very pale, and the vessels were markedly reduced in size. The biomicroscopic examination was negative. The fields of vision were as seen in figure 5. The patient was referred to Dr. Howard McIntyre

for a neurologic examination. He found absent knee jerks, diminished abdominal reflexes, and slight ataxia, especially in the left leg. The Romberg sign was slightly positive. Pain sense was diminished from the first lumbar segment downward in the left leg; the vibratory sense was diminished in both legs. The spinal-fluid pressure was normal, and showed a positive Wassermann, 90 lymphocytes per cubic millimeter, luetic type of gold curve, and an excess of globulin. The blood Wassermann was likewise positive. A diagnosis of meningovascular lues was made, and the patient was placed on antiluetic treatment. On December 1, 1937, he returned. The vision in the right eye was reduced to 20/50—, and with the left he could count fingers at six feet.

There was no change in the appearance of the disc. At a subsequent examination on December 21, 1937, vision was: R.E., 20/50; L.E., ability to count fingers at six feet. On February 7, 1938, vision in the right eye was reduced to 20/200, and in the left it was as before. Both discs were very pale, with a visible lamina cribrosa and marked vascular constriction, about equal in each eye. The vision with both eyes open was 20/200, and was a little better in

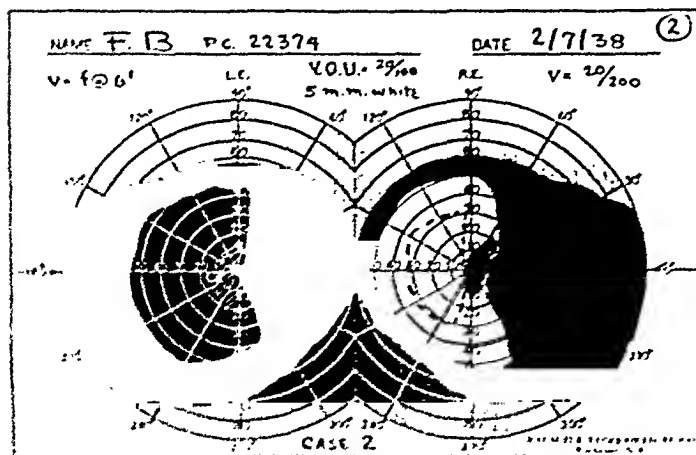


Fig. 6 (Vail). Field of vision (F. B., case 2).

dim illumination. The fields of vision are depicted in figure 6. On May 4, 1938, vision was: R.E., 20/200; L.E., ability to count fingers at $2\frac{1}{2}$ feet on the temporal side. The nerve heads exhibited no change. A tentative diagnosis of chiasmal arachnoiditis was made, and operation was advised, but the patient refused to consider surgery. During these months active antiluetic treatment had been carried out, including 10 chills with malaria. The fields of vision were as seen in figure 7.

Case 3. M.E., white, male, aged 61 years, was referred by Dr. N. A. Martin, Gallipolis, Ohio, in consultation. Dr. Martin reported that when he first saw the patient in October, 1937, the visual acuity in the left eye was reduced to the ability to detect hand movements at two feet, and the corrected vision in the right eye was 20/30. Both discs were pale, and there was marked constriction of the retinal vessels. The blood Wassermann was 4+. He was placed on antisypilitic treatment, but in spite of this the visual loss was progressive. He was examined by me on February 14, 1938. He stated that two or three years previously the vision in his left eye had suddenly grown dim. At that time he was told by an ophthalmologist that he had had a hemorrhage in the eye, and that nothing could be done for him. Six months ago the vision in the right eye had begun to fail.

Examination: Vision in the right eye, uncorrected, was less than 20/200; corrected, 20/30+ and J.2. The pupil was slightly enlarged, but reacted sluggishly to light. The lens was clear, but the vitreous showed fine, dustlike opacities. The optic-nerve outline was sharply defined, with normal

physiologic cupping and a visible lamina cribrosa. The entire optic nerve was pale, particularly on the temporal side. The vessels were markedly reduced in caliber and irregular. There were signs of vascular hypertension. An old, minute spot of focal choroiditis was present near the disc margin, below the temporal side. The palpebral fissure was more widely open than normal. In the left eye vision was reduced to light perception only—no projection. The pupil was dilated and fixed. The outline of the nerve head was somewhat pale and blurred. There was marked pallor of the nerve head, the lamina cribrosa was not visible, and the vessels were much reduced in size. The macular area appeared to be somewhat edematous, and was stippled with pigment as if it had been

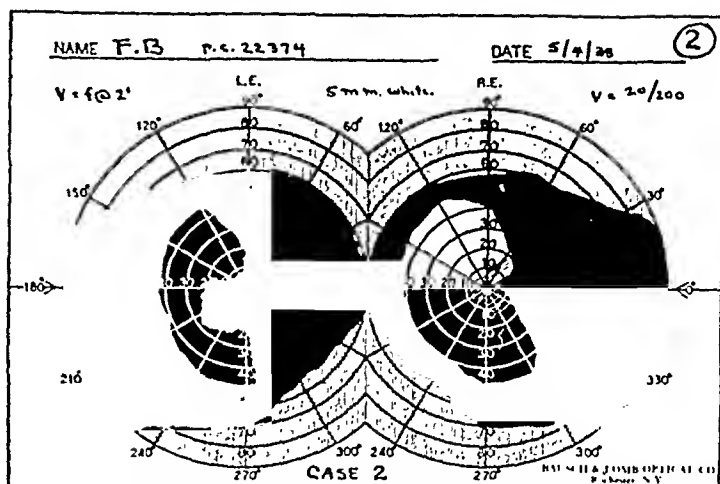


Fig. 7 (Vail). Field of vision (F. B., case 2).

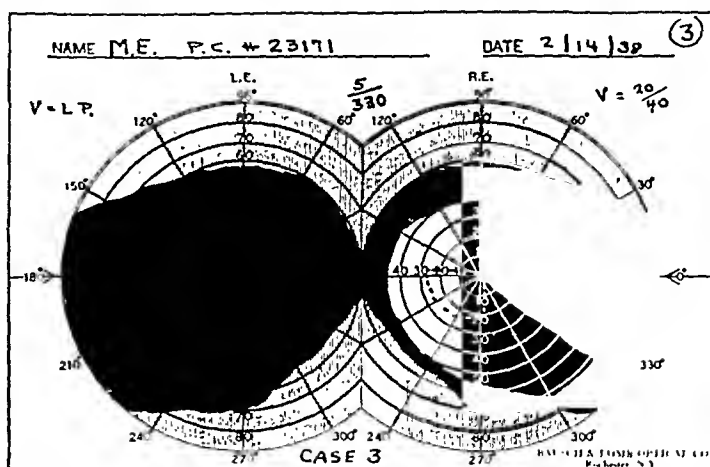


Fig. 8 (Vail). Field of vision (M. E., case 3).

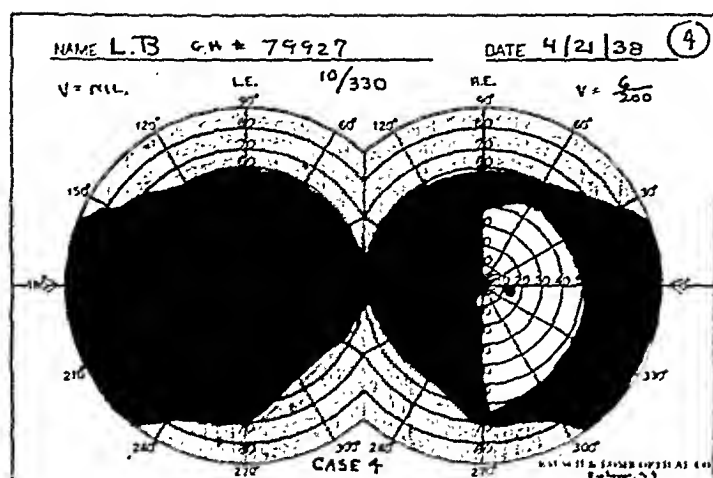


Fig. 9 (Vail). Field of vision (L. B., case 4).

alyzed, and the left eyelid drooped partially. She developed headaches of a pounding, continuous character, deep in the left temporal region and above the eye. The headaches continued unchanged until September, when they subsided to a dull ache which gradually disappeared. One year later the headaches recurred, and the left eyelid again drooped. Her speech became mumbling. She said that her eyesight had always been poor, and that she had

the seat of an old macular hemorrhage. There was a new blood-vessel formation, and proliferative retinitis three disc-diameters from the edge of the disc along the superior temporal artery was present. The fields of vision are shown in figure 8. Malarial treatment was advised, with the understanding that if the progress of failing vision in the right eye were not checked, an exploratory operation of the chiasmatic area should be undertaken.

In a letter of April 8, 1938, Dr. Martin reported as follows: "His eye condition at the present time shows some increase of the visual field—the red target is well visualized over twice the area it was previously noted. He stood 12 severe chills with marked temperature reaction very well, and his general condition improved." Because of the improvement in his field of vision, the patient reasoned that operative interference should be undertaken only as a last resort after every other means had failed to help him.

Case 4. General Hospital No. 79927. L. B., colored, female, aged 27 years, was throughout 1934 a patient in the Branch Hospital, with a diagnosis of far-advanced pulmonary tuberculosis with cavitation in the right apex. She was discharged in 1935. In July, 1936, she complained of numbness of the face. Two days later her right side became par-

changed glasses frequently.

The physical examination was negative, except for evidence of an arrested tuberculosis at the right apex. The neurologic examination, made on September 30, 1937, showed complete left third-nerve paralysis and marked lower right side seventh-nerve weakness. The tendon reflexes on both sides were active. Blood examination: Kahn, 3+. Spinal fluid examination: Wassermann, 3+, positive gold curve, protein, 165 mg. per 100 c.c. Blood pressure, 100/72.

The ocular examination on April 13, 1938, showed vision in the right eye to be 6/200. The pupil was dilated, but reacted. The disc was pale, with sharp outline, visible lamina cribrosa, and the vessels were reduced in size. The left eye diverged about five degrees. The pupil was dilated, and did not respond to light. The disc was atrophic, with sharp outline, visible lamina cribrosa, and the vessels were reduced in caliber. Vision in this eye was reduced to no light perception. The vision in the right eye, with +3.75 D. sph. = + 2.00 D. cyl. ax. 175°, was 20/70. The vision in the left eye could not be improved. The field of vision showed a sharply evident temporal defect (fig. 9). A diagnosis of syphilitic arachnoiditis and syphilitic thrombosis of the cerebral vessels with a bilateral mixed

type of optic atrophy was made. The patient had had inadequate antisyphilitic treatment, and it was considered wiser to try conservative treatment before undertaking surgery.

Case 5. General Hospital No. 43842. W. P., white, male, aged 64 years, had in February, 1937, noticed blurred vision of the right eye. He exhibited no other symptoms except a chronic cough.

Past history: In 1909 he had had an apoplectic stroke affecting the left side and causing diplopia. The paralysis subsided in 24 hours, but weakness persisted for six months. There was a history of chancre at the age of 19 or 20. He had received only four therapeutic injections. On March 11, 1937, the blood Wassermann was negative; the Kahn test was positive. The vision in the right eye was 5/200 unimproved, and the pupil did not react to light. The disc was very pale, with indistinct nasal border, and the vessels were markedly reduced in size; the color of the nerve head was white, and the lamina cribrosa was visible. The vision in the left eye, which had been 20/20 in 1937, was now reduced to 20/100; the pupil reacted sluggishly; the disc was slightly pale, with sharply defined border; the blood vessels were reduced in size, and the lamina cribrosa was visible. Blood pressure, 140/90. The field of vision is shown in figure 10.

Case 6. General Hospital No. 91810. A. H., colored, male, aged 42 years, first noticed dimness of vision in the right eye in February, 1938. One month later the vision in the left eye began to fail. He complained that at this time he could not see anything with the right eye. A history of chancre in 1929, gonorrhea in 1919, and again later, was given. He drank about one-half pint of "moonshine" daily from 1922 to 1929.

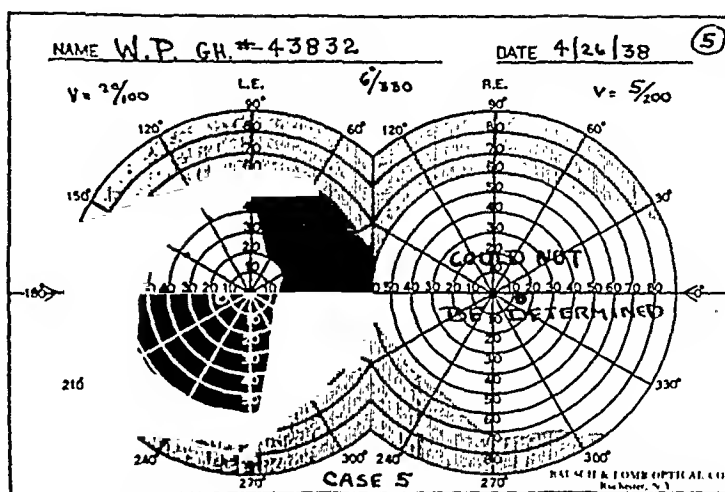


Fig. 10 (Vail). Field of vision (W. P., case 5).

Physical examination: Blood pressure, 220/140. The motor and sensory systems were intact. The Kahn test and blood Wassermann were strongly positive. Spinal-fluid examination revealed a positive Wassermann and a positive gold curve. The vision in the right eye on March 30, 1938, was light perception only; in the left eye, it was 20/30. On May 16, 1938, the vision in the right eye showed no light perception, and in the left eye was reduced to detecting shadows and hand movements. The blood examination on April 12, 1938, disclosed hemoglobin, 13.8 mg.; red blood cells, 4,480,000; white blood cells, 4,750. The urine examination was negative. On April 20, 1938, examination of the right eye revealed a dilated pupil which reacted sluggishly. The disc was pale and yellow-white, with sharply defined border. There was a large temporal conus, with chorioidal atrophy, visible lamina cribrosa, small arteries, and full veins. The left pupil was small and reacted actively. The disc was pale, and the lamina cribrosa was visible, with a deep, wide physiologic cupping to the temporal border. The arteries were somewhat reduced in size. The field of vision is shown in figure 11. A diagnosis of arachnoiditis affecting the optic chiasm was made, but an exploratory operation was not advised at

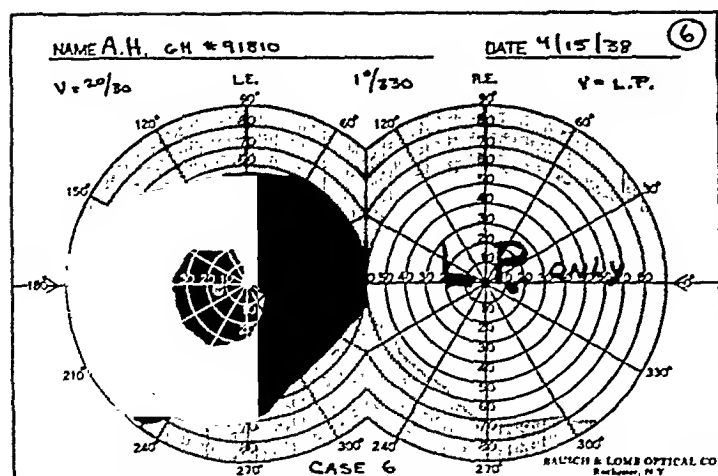


Fig. 11 (Vail). Field of vision (A. H., case 6).

the time, since it was believed that the antiluetic treatment had not been sufficiently carried out.

Case 7. W. C., colored, male, aged 55 years, stated that his vision had been failing for about one year, but he had not realized how bad it was until he was examined. There was no history of chancre or of antiluetic treatment.

An X-ray examination of the skull was negative. On April 26, 1938, the blood Kahn test was positive to desensitized antigen only, and lumbar puncture showed a clear fluid with a pressure of 160 mm.; cells, 130; Wassermann strongly positive; gold curve positive; protein, 99 mg. Neurologic examination was negative. A diagnosis of syphilis of the central nervous system, taboparesis, and syphilitic chias-

mal arachnoiditis was made.

Ocular examination: Vision was: R.E., 4/200; the pupil was dilated and reacted sluggishly. The optic-nerve head was atrophied, white, and had a sharply defined outline and deep physiologic cupping; visible lamina cribrosa, and the arteries showed irregular narrowing, whereas the veins were of larger size than usual. Tension was 17 mm. Hg (Schiötz). Vision in the left eye was 20/100. The pupil was small

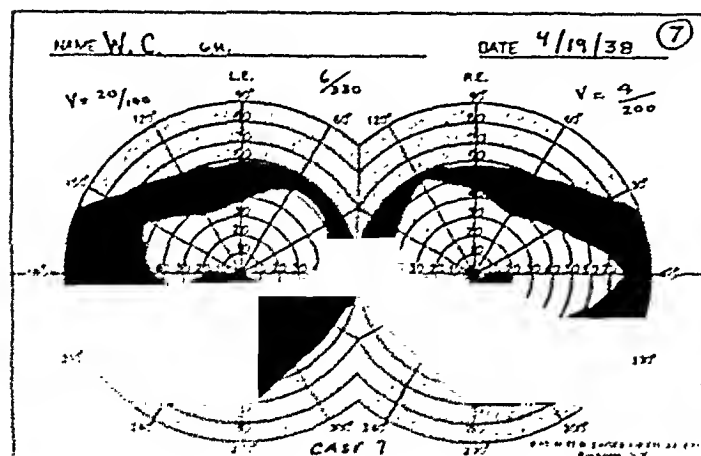
and reacted well to light. The disc showed the same findings as in the right eye, except that it was a little paler. The ocular tension was 19 mm. Hg (Schiötz). Blood pressure, 175/110. The fields of vision were as seen in figure 12. The patient was given antisyphilitic treatment, with the understanding that if further loss of vision or fields occurred, an operation was to be performed.

COMMENT

These patients all show the four essential points necessary to arrive at a diagnosis of syphilitic opticochiasmatic arachnoiditis: (1) Rapid loss of vision; (2) chiasmatic field defects; (3) mixed type of optic atrophy; (4) a history of or positive serology of syphilis. The diagnosis in case 1 was substantiated at operation. The other patients will be kept under close observation, and with their consent will be operated upon if there is no improvement under conservative treatment.

SUMMARY AND CONCLUSIONS

The literature on syphilitic opticochiasmatic arachnoiditis is reviewed, and seven additional cases, six of which are presumptive, are reported. Three of these cases were diagnosed by neurologists as of *tabes* or *taboparesis*.



A history of vascular lesions was obtained in two cases. The fields of vision showed defects that are considered to be characteristic of chiasmal involvement. Attention is directed to the mixed type of optic atrophy seen in all cases. The writer considers this type as one of the pathognomonic signs of chiasmatic arachnoiditis, and that it indicates a combination of simple atrophy and neuritis.

This study indicates that if neurosurgery is performed before it is too late improvement in vision may result. Hans

Reese, neurologic editor of the 1937 Year Book of Neurology, Psychiatry, and Endocrinology, in commenting on Hausman's paper, says that: "The more acute syndromes of this entity should be treated medically prior to surgical intervention, whereas a damaged optic chiasm with progressive field defects (low-grade reactivity in blood and spinal fluid) should be treated at first surgically and thereafter medically."

Carew Tower.

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DISCUSSION

DR. RALPH I. LLOYD, Brooklyn: I am very much interested in Dr. Vail's paper, and particularly in the details of the autopsy and the operative findings in the anterior cistern about the chiasm. It seems to me that the specific cases considered as optic-nerve atrophy and ocular tabes are really of the type described by Dr. Vail. None of my cases has come to autopsy or operation, but perimetric examinations, if made early in the case, usually show that the original lesion first affects one nerve or tract, and later spreads to the chiasm. Progress is usually steady, and in some cases it is so rapid that the lesions must be vascular oc-

clusions. If the case is seen late, the white disc, shriveled retinal arteries, poor vision, and very small and irregular fields compel one to diagnose the condition as optic-nerve atrophy.

As an example of what early perimetry will reveal, I wish to report the case of a man in his late fifties, who lost the vision of one eye over night. He denied specific infection until the Wassermann reaction was reported as 4+. He exhibited Argyll Robertson pupils. The infection had occurred 35 years before the first ocular symptoms appeared. He had been under the care of an oculist who also did nose and throat work, and Van

der Hoeve had just published his article showing that the enlarged blind-spot is a regular accompaniment of sinus disease. The ethmoidal cells on the affected side were exenterated and the removed tissue sent to a pathologist, who reported hyperplastic rhinitis, which was considered a satisfactory explanation of the sudden loss of vision. The visual field of the apparently normal left eye showed that the superior temporal quadrant was missing, which, with the other eye already blind, positively fixed the site of the lesion at the chiasm, but indicated also that the lesion had originally affected one nerve first and then spread later to the chiasm. The remaining portion of the temporal field (inferior quadrant) failed gradually during the next four weeks, by which time there was one blind eye and a temporal hemianopia in the other: very typical of a chiasmal lesion and often seen in pituitary disease. After a short interval, the macular area of the functioning nasal half of the field faded out, and in another month the second eye was also totally blind. The knee jerks were normal until the patient was blind in both eyes.

Another case of this type began with very poor vision in the left eye in a man in his forties, who had had specific infection about 15 or 20 years before. The visual field of this eye showed a sectorial defect above, but the macular area was seriously affected, reducing the vision to a low figure. The superior border of the field of vision of the apparently unaffected eye soon began to disappear, and the conclusion was that the optic nerve of the left side had been affected first and that the lesion had later spread to the chiasm, but all of this change occurred on the inferior surface. I was not able to follow the case further, but it undoubtedly was of the type which, when seen later, exhibits an altitudinal hemi-

anopia but with very poor vision, since the macular area in these cases does not hold out as in cases of lesions behind the optic thalamus.

The general features of these cases are early pallor of the disc, steady—and often rapid—progress, early involvement of the macula, and, in the slower cases, bizarre visual fields. Many other nonspecific and nonpituitary cases that do not furnish a satisfactory etiology are much slower in development, with visual fields ranging from irregular binasal hemianopia to the contracted fields of optic atrophy, which can be explained only upon the basis of a similarly located disease, but up to the present time we have no exact details to settle this question. In older persons with similar visual-field defects, a satisfactory explanation is forthcoming. Considerable effort has been made to study these cases by autopsy and microscopy, with the result that the effect of pressure of sclerosed portions of the circle of Willis upon the chiasm, tract, and optic nerve is well understood. The anterior communicating artery has been found to cause a deep indentation in the superior aspect of the chiasm, and is the explanation offered for the early appearance of central scotomas because of the decussation of the macular bundles near the upper surface of the chiasm in the middle line.

Binasal hemianopia was shown by Herman Knapp to be the result of pressure of the posterior communicating arteries upon the optic tracts just behind the chiasm. Fuchs examined the brains of elderly persons and found amyloid bodies in the optic nerves with here and there patches of sclerosis. The amyloid bodies produced atrophy of the fiber bundles by direct pressure. In addition to these features, Fuchs found that the optic nerve was indented on the inner aspect, where it was pressed against the

sharp margin of the dura at the entrance to the optic canal, by the sclerosed ophthalmic artery.

The cases cited here occurred prior to the salvarsan period, and the question of the effect of arsenicals upon the optic nerve does not enter here. I hope Dr. Vail will give us more information on this subject, for we are sorely in need of exact knowledge concerning the pathology of the syphilitic lesions at the chiasm, and also as to the nonspecific and the nonpituitary cases.

DR. DERRICK VAIL, closing: I am grateful to Dr. Lloyd for pointing out the progressive effect on the field of vision in these cases, from the beginning to the end. Chiasmatic field defects are well known, and nothing new has been added by my contribution, except to point out the importance of this area in certain

lesions. Many other ramifications with which we did not deal might be considered; for example, the traumatic type of optico-chiasmatic arachnoiditis, and the suggestion that the optic atrophy of syphilis is due to the lesion arising in the chiasmatic cisterna affecting the optic nerve. Neither does the paper touch on the possibility that multiple sclerosis may have its origin in the chiasmatic area. It does not bring into the report the cases of Leber's disease that have been operated upon and in some of which arachnoidal membranes were found. It does take up, as Dr. Lloyd said, an entirely new field. I feel that Americans, in spite of the early work, particularly that of Cushing, have been a little remiss in not continuing their investigations. The French have taken over the field and have developed the subject extensively.

MANAGEMENT OF GLAUCOMA FOLLOWING CATARACT OPERATION*

B. Y. ALVIS, M.D.
Saint Louis

It is the purpose of this essay to deal with the therapeutic management of glaucoma as a complication of the cataract operation. There is probably no problem in ophthalmology that taxes our ingenuity more than this. There is none that requires greater vigilance nor greater persistence. There is no rule by which one may predict the length of time a case may take nor the end result. A single fortunate prescription or operation may bring permanent cure, or one may run the gamut of medical and surgical measures only to see the vision fade and the eye come to enucleation for the relief of the intolerable pain.

No extended description of the clinical entity under consideration is necessary, since an excellent thesis by Fox¹ was published only a year ago, giving a comprehensive view of the subject.

However, a brief review of the essential points may be worth while.

The term *postoperative glaucoma* is a broad one and includes cases differing widely in many clinical aspects, such as pain, congestive symptoms, time of onset relative to operation, effect on vision, and so forth, but having the one common essential feature; namely, increased intra-ocular pressure.

The cases divide themselves roughly into two groups: one, including those that arise soon after the cataract extraction or needling, usually exhibits signs of acute congestive glaucoma of greater or less

degree; the other, those that appear long, half a year or more, after the operation and usually follow a more or less quiet course resembling chronic or simple glaucoma.

Natanson² and others regarded the first group as comprising cases of secondary glaucoma arising as a result of operative imperfections, while the second, quiet group consisted of cases of primary glaucoma independent of the operative procedure.

As to etiology, there is general agreement that obstruction of the drainage angle is the essential causative factor. There are many operative and postoperative mishaps that may bring about such obstruction.

Vitreous entering the aqueous chamber, as noted by Bowman³ in 1865, may be the cause. The rupture of the hyaloid membrane in needling a secondary capsular cataract, or in the course of an intracapsular extraction, or when there is vitreous loss, becomes a predisposing cause of glaucoma.

Graefe⁴ noted rise of tension due to release of cortical remnants trapped in the collapsed capsule. He also mentioned ciliary irritation by traction on the zonula as leading to congestion and rise of tension. Plastic iritis with synechiae to the capsular remains has been the cause in many cases, as first noted by Priestley Smith.⁵

Adhesions of the lens capsule to the wound drawing the ciliary processes forward and closing the angle was demonstrated by Collins.⁶ Iris adherent to or in the wound has been described by many

* From the Department of Ophthalmology, Washington University. Read before the Saint Louis Ophthalmic Society, April 30, 1938.

and noted by all of us as a factor in causing glaucoma. Elschmig⁷ was perhaps the first to note an ingrowth of epithelium through a badly coapted wound, lining the anterior chamber and closing the angle. Dupuy-Dutemps⁸ mentioned a low-grade infection entering through imperfectly closed wounds as a source of ciliary congestion leading to rise of tension.

A scrutiny of these causative factors reveals each of them as a fault in technique. Dr. Hill Griffith asserted that glaucoma does not follow uncomplicated cataract extractions.

We have seen it follow in cases in which the operative and postoperative course was apparently uneventful, but one cannot be sure that no traction was exerted on the ciliary processes, leading to congestion and circulatory embarrassment.

One can be sure that an eye, after a clean-cut operation without adhesions of capsule or iris to the wound, with all cortex removed and incision firmly closed, is less liable to glaucoma than to other complications.

The pathology of postoperative glaucoma as revealed by microscopic study of enucleated eyes was carefully observed and described by Collins⁶ in 1890 and by many others since then.

Naturally, no eyes have been thus studied in which the glaucoma yielded to treatment. These are the characteristic findings:

The anterior chamber is generally shallow. The lens capsule is found adherent to the operative cicatrix in those cases in which the capsule was not removed. When no capsule is present, the hyaloid membrane may be adherent to the corneal scar. After iritis, the capsule may be "converted into a thick membrane by inflammatory effusion" with the iris adherent to the membrane. Blocking of the

angle of the anterior chamber occurs either by the root of the iris or by ciliary processes dragged forward by entangled shreds of capsule or vitreous. In inflammatory cases cell infiltration into the tissue of the iris and meshes of the ligamentum pectinatum is noted. The choroid may be much thickened by inflammatory infiltration. The retina may show cystic degeneration or occasionally detachment with fluid behind it. The optic nerve shows glaucomatous cupping except in the more recently inflammatory type, in which case it may be swollen and infiltrated with round cells. The vitreous usually is more fluid than normal and may contain remains of hemorrhages or inflammatory effusion.

That there is an inherent tendency to glaucoma in the majority of these cases must be seriously questioned, since in so many cases the fellow eyes are not especially liable to glaucoma whether operated on or not.

These pathological changes may bring about rise of tension in two ways. First, by increased formation of intraocular fluid as a result of drag on the ciliary body and processes; second, by blocking the angle of exit so that fluid is retained unduly in the cavum oculi.

That the presence of the capsular adhesions in the wound is not alone sufficient cause of glaucoma is shown by the fact that many cases in which adhesions exist show no rise of tension or have no attack until needling is done or some injury to the eye is suffered. Collins⁶ suggests that this added insult is necessary to start the increase in formation of fluid beyond the rate of drainage. The herniation of the vitreous into the aqueous chamber where it can obstruct the drainage angle seems a more probable cause of the rise in pressure.

The incidence of glaucoma following

operation for cataract ranges around 1 percent. Collins studied the records of 1,405 cases at Moorfields and found nine cases or 0.64 percent. A. Knapp⁹ reported 1 percent after primary extractions and 1 percent after discissions. DeGama Pinto¹⁰ reported 2 percent of 326 needlings. Rennecke¹¹ and Cavara¹² both found equal incidence after combined and simple extractions.

PREVENTION

Turning to the clinical management of cases it seems important to give some thought to prevention. Since the underlying causes and pathological conditions are direct results of faulty or ill-chosen operative procedures it would seem worth while to study the operation with a view to avoiding these errors.

1. The incision is the most important feature of the operation. It should follow the corneoscleral junction and should have a conjunctival flap above to aid in coaptation of the margins. It must be ample in size.

2. Avoid loss of vitreous. One cannot secure a neatly closed wound free of capsule, iris, cortex, and vitreous if the latter is protruding through the wound. The actual vitreous substance lost is much less important than the complications of wound closure.

3. The question of iridectomy, complete, peripheral, preliminary, or simple extraction has been argued pro and con. Statistics of large reported series are not definitely favorable to any one method. Without question an intact iris with the angle free offers the best protection against entanglement of vitreous, capsule, and cortex in the wound. The difficulties of delivering the lens through a round pupil and of avoiding iris adhesions or even prolapse often more than outweigh these advantages. Unless the pupil dilates

freely and well, I believe the complete iridectomy the safer procedure.

4. Intracapsular or extracapsular extraction presents another field of argument. Again it seems obvious that the complete removal of the lens favors an open angle and a wound free from adhesions, but if such a delivery can be accomplished only by an undue traction on the zonula, excessive pressure, and danger of vitreous loss, the gain is too dearly bought.

5. The toilet of the wound is a step of great importance in avoiding postoperative glaucoma. Great care in freeing the wound of all débris of capsule, iris, cortex, and clots in order to secure quick and accurate wound closure is entirely worth while. A large bubble of air injected into the anterior chamber at the close of the toilet is sometimes helpful in freeing the angle.

6. In capsulotomy a single, small, vertical cut through the membrane or a small inverted V opening made with a narrow knife needle with a tapered shank, so that vitreous will not be drawn into the corneal wound, should be made. The pitfalls here are the flooding of the anterior chamber with vitreous and the anterior synechia of hyaloid or capsule. A vitreous tag in the wound that easily escapes notice may lead to low-grade infection and congestion causing glaucoma.

The discission should be postponed until the eye is quiet. Use no atropine after needling unless iritis develops and the eye is soft.

7. The tension should be taken frequently in postoperative cases, and these should be kept under observation for some months if possible.

In general, prophylaxis is to keep the anterior chamber and filtration angle free and secure quiet postoperative healing, to avoid trauma to the ciliary body, and to

detect any tendency to a rise in tension before damage is done.

TREATMENT

The management of postoperative glaucoma calls for ingenuity and versatility and, above all, vigilance and persistence.

In the literature is recorded the use of practically every means that has been devised for the lowering of intraocular tension. No one measure has been attended with such outstanding success as to be considered a reliable cure for postoperative glaucoma. Where one fails, another may succeed. These measures may be divided into four general groups; namely, local medication, local physical therapy, general medication, and surgery.

1. Local medicaments are the miotics, the mydriatics, and the epinephrine preparations.

(a) The miotics, pilocarpine and eserine, appropriately head the list of local therapeutic agents. These are, after all, our most dependable agents. It is our practice to begin with pilocarpine 1 percent. Some cases respond at once with lowered tension. In most this response is only temporary and soon increasing strengths of pilocarpine (up to 5 percent) are necessary. If these do not aid, eserine is used, beginning with 0.5-percent solution. If eserine maintains lowered tension but must be used for a long period, an eserine sensitization develops. Eserine alkaloid in castor oil or in an ointment base may then be used. Even after surgical measures, one often must continue the miotics.

(b) The mydriatics—homatropine and atropine. In an occasional case with frank iritis these may reduce tension and lead to a cure, but must be handled with great caution.

(c) Epinephrine preparations—glauco-san, suprenen bitartrate (a 2-percent

solution or in ointment form) epinephrine 1/100, epinephrine 1/1000 as a pack are useful in certain cases of postcataract glaucoma. As a rule, in the acute or congested stage, the epinephrine preparations are not helpful. They may even cause severe pain and a further rise of tension. After the miotics have been used for some time, perhaps even after surgery and if the case has reached a stage with little congestion, when the tension remains up in spite of treatment, one may find this concentrated epinephrine surprisingly effective. One must be cautious at the beginning. Give the first treatment at the office or hospital where the tension can be measured after an hour or so. If the tension rises abruptly, a paracentesis should be done at once and eserine instilled. Even when effective, epinephrine is best used in conjunction with a miotic. I can, however, think of three patients who use only epinephrine 2 percent in water-soluble base, and only when they feel pain or blurring vision, indicating a rise of tension.

2. Local physical therapy includes heat, cold, and massage.

(a) Hot fomentations. Frequent and prolonged, this is the most useful of all nursing measures.

(b) Radiant heat. The infrared lamp, a simple 16 c.p. carbon filament bulb, any electric heating device may be the source. On ward service the infrared lamp is more apt to be applied as much and as often as ordered than moist heat which requires constant attendance of the nurse. Also radiant heat seems to penetrate deeper.

(c) Ice-cold applications. In occasional congestive cases cold may give greater relief from pain than heat, and should not be forgotten. Heat is more often useful.

(d) Massage of the eyeball may help to keep open an operative drain.

3. Constitutional medication.

(a) Ergotamine tartrate—intramuscular or oral administration of 1-mg. (1/60 gr.) doses has been recommended and seems to have been useful in some of our own cases.

(b) Calcium, gluconate or chloride. Both these medications are used for their effect on the sympathetic nervous system.

(c) Intravenous hypertonic solutions serve to withdraw fluid from the tissues and actually reduce intraocular tension. This effect is transitory lasting at most a few hours. This is useful as a preoperative measure.

(d) Purging and sweating fall in the same category and have not seemed worth while in our observation.

(e) Fever therapy may be useful where tension is secondary to uveitis. Typhoid bacilli are our choice, but milk or the hypertherm or hot baths may be used.

4. Surgical measures.

In the great majority of cases surgery is necessary. No one operation has found favor with any convincing majority of eye surgeons, but the following have the most success to their credit:

(a) Iridectomy. H. Knapp reported marked success in an early series of cases following simple extracapsular extraction. The general experience has not been so favorable especially in recent years.

(b) Cyclodialysis is considered the operation of choice in this particular type of glaucoma by Elschmig, Fuchs, Gradle, and others. It does serve to break up anterior synechiae of iris and capsule and doubtless is successful in many instances. It also is easy to do and does not mutilate the eye nor preclude subsequent operations by the same or other methods. Our own experience with this operation is not so satisfactory.

(c) Iris inclusion. This operation has grown largely in favor in recent years. Its simplicity and safety in execution and the permanency of drainage secured make

it a valuable measure. Even when the immediate reduction of pressure may be insignificant or nil, the ultimate result may be good.

(d) Trephining, especially if done in an area where the iris has been undisturbed previously is successful in a fair proportion of cases.

(e) Sclerectomy or iridosclerectomy (Lagrange) or Berens irido-corneo-sclerectomy are operations to be considered.

This by no means exhausts the list of operative and conservative measures that have been employed but includes most of those that we have used.

CASE REPORTS

The following cases are presented in some detail to illustrate what actually has been done. Some have rewarded our efforts with success; others have not.

Mr. F. X. M., aged 39 years, had had an extracapsular extraction of the left eye on February 19, 1931, with peripheral iridectomy. Very little cortex remained, but the postoperative course was rather stormy. In six weeks the vision with correction was 15/16. Three months after operation the capsule was still rather thick and a capsulotomy was performed. Some cortical material was stirred up, but the vision cleared to 15/10 in one week and remained good for two years, when thickening of the capsule lowered the vision, and a second Ziegler capsulotomy was done on May 24, 1934. The wound in the cornea did not heal for several days (probably due to vitreous shreds dragged into the wound by the needle), but in one week the vision was 15/12; the eye quiet and soft. Three days later, on June 2, 1934, an acute attack of glaucoma occurred. The tension was 47 mm. Hg (Schiotz), and was reduced by pilocarpine 1 percent administered every two hours.

Thereafter the course was as follows:

Date	Tension mm. Hg	Treatment
June 6	18	Pilocarpine, twice daily.
8	52	Pilocarpine, every two hours.
9	37	
11	52	Pilocarpine, 4 percent, four times a day.
12	14	
14	47	Eserine 0.5 percent four times a day.
15	10	
25	16	No medication; massage.
July 6	30	Eserine, once daily.
Aug. 1	Acute attack	Cyclodialysis by Dr. H. S. Gradle. Pilocarpine three times daily brought tension to normal until.
Sept. 7	37	Suprarenin jelly, 2 percent, instilled; tension rose to 47 mm. Eserine 1 percent three times daily.
8	30	
10	18	Twelve hours after eserine.
Oct. 13	20	Using eserine irregularly.
27	40	Eserine prescribed three times daily.
30	18 at 8:30 A.M.	Four hours later.
	37	Eserine three times daily.
Nov. 19	18	
30	37	Iridotaxis. Very little postoperative reaction.
Dec. 7	Normal to touch. Vision 15/12.	
15	+1 to touch	Eserine, 1 percent once.
26	22	

This patient has been seen occasionally since that time up to May, 1937. The tension remains normal with occasional instillation of eserine when he feels he needs it. The vision is normal as are the fields of vision.

Here, the iris inclusion seemed to be the solution.

As an illustration of those cases that refuse to yield to our best efforts, I cite the case of Mrs. E. D., aged 50 years, whose eye was needled two months after an extracapsular extraction. A considerable amount of cortical remains was liberated. There was an immediate rise of tension within 24 hours. In the two-and-a-half years that followed, this patient made 114 office visits; had 15 paracenteses of the cornea for temporary relief; had two iris-inclusion operations. She used pilocarpine and eserine solutions almost constantly besides hot packs, infrared heat, and massage locally; also saline eliminations, iodides, salicylates, gynergin, thyroid extract, and bacterial antigens. She had teeth, gall bladder, and sinuses

examined and treated. She had uveitis and arthritis as complications.

During this time the tension curve resembled a septic temperature chart ranging from 18 to 52, mostly about 30. At the end the eye was fairly quiet, tension 33 mm. Hg, and vision 5/60. The fellow eye remained normal throughout it all.

The next case is one in which persistent conservative treatment has been sufficient.

Mrs. W. H. S., aged 65 years, had a moderate rise of tension 14 days after intracapsular extraction. The operation and recovery were uneventful otherwise. Pilocarpine kept the tension low and in one month glasses were ordered; the vision being 5/5—.

Ten months later the vision was still 5/5, and the tension 47 mm. Hg. Pilocarpine 2 percent three times daily reduced the tension to a range of 16 to 20 and maintained it so with an occasional rise to 26 or 30. On January 7, 1936, the tension was 30 and suprarenin 2 percent in jelly was instilled, bringing the tension to 18 in 45 minutes. This preparation

alone used at night kept the tension low for the next six months, when it again rose to 33 mm. Hg. Pilocarpine three times daily was added and since then for one-and-one-half years, she has followed this routine fairly regularly. When she becomes careless and omits either the suprenin or the pilocarpine for a few times, the tension rises and the vision gets blurry. The visual fields and central vision so far have not been impaired. The disc is not pale nor cupped. The other eye has a mature cataract but is otherwise apparently healthy.

The following case was an apparently uncomplicated intracapsular extraction with iridectomy which ran a smooth post-operative course. There was a mild striped keratitis and, two weeks after operation, a small bit of vitreous was visible at one point in the wound. This healed soon and one month after operation the vision was 5/5. Three weeks later, however, there was some pain and redness, and the vision was 5/15. Tension was 18 mm. Hg. The next week the patient reported with a tension of 52 mm. Hg.; cornea steamy; and vision 5/25. There had been pain in the head and nausea and vomiting. Two-percent pilocarpine with hot fomentations reduced the tension, and vision again became normal within three days. The tension rose again during the next three weeks and suprenin jelly was used and ordered once daily with pilocarpine twice daily. There was no further rise in tension, and medication was gradually discontinued. When last seen, five months after the first rise of tension, the eye was quiet and tension 18 mm. Hg.

This was apparently a case in which the glaucoma was due to a low-grade infection which entered a small unclosed portion of the wound, leading to a congestion of the ciliary body which yielded to time, while the tension was held in

check through the combined influence of suprenin and pilocarpine.

A very recent case illustrates the necessity for a variety of therapeutic agents.

Mrs. W. C. B., aged 50 years, has had bilateral cataract extraction, extracapsular, with some adhesion of the capsule to the wound. The right eye was almost blind when trephining was done. The tension rose again in the right eye and shortly afterward in the left eye. The patient was highly nervous, and apprehension seemed to have brought about the attack in the left eye following a visit to her home oculist who had performed the operations. Eserine and pilocarpine were being used when I first saw her. The vision was ability to see hand motion in the right eye; 5/60 in the left; and the tension was above 100 mm. Hg.

Suprenin bitartrate 2 percent in jelly was used in the office; after a wait of an hour, the tension dropped to 40 mm. in each eye and the vision of the left had improved to 5/15.

After three days of hospital rest, where suprenin was used twice daily and pilocarpine 2 percent every two hours, the tension became and remained normal.

Two weeks later, following a visit to her home oculist who measured the tension as normal, the pressure again rose; this time medication and paracentesis failed to lower the tension permanently. Cyclodialysis was done, but the tension remained normal only a few weeks, even with medication, so an iridencleisis was performed on each eye. This time a slow rise in tension has been controlled by pilocarpine and eserine in the left eye; but the right eye, on her last visit, had tension of 40 mm. Suprenin was again tried, and in one hour the tension was 18.

The prognosis of postcataract glaucoma is not good. Of the series reported by Fox, about one third had good to fair

vision, one third had poor vision, and one third had no vision. This agrees in a general way with our own experience. With the thorough coöperation of patient and eye physician, we can save some vision, in most of these eyes, for many years; some of them can be cured; and some of them will be lost.

As a final word, I repeat these thoughts. The best treatment is careful cataract surgery to avoid the complications that give rise to postcataract glaucoma; but once the attack comes, the utmost versatility and perseverance in treatment is required.

900 Carleton Building.

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METASTATIC SEPTIC ENDOPHTHALMITIS WITH RING ABSCESS OF THE CORNEA*

CASE REPORT, CLINICAL HISTORY, AND PATHOLOGIC ANATOMY

CHARLES W. TOOKER, M.D.

Saint Louis

Endogenous infection within the eyeball has been recognized as a disease entity for many years, but the interpretations of clinical observations and pathologic anatomy have varied considerably. Virchow¹ described endogenous infection of the retina in 1856, and stated that the choroid is not necessarily affected first. Purulent metastatic ophthalmia is a rapidly destructive disease, producing necrotic disintegration of the tissues within the eye, and usually terminating in panophthalmitis. A less malignant type of endogenous intraocular infection was first described by Roth² in 1872 and named "simple" septic retinitis. This observer wrote that septic retinitis is much more frequent in septic processes than is purulent metastatic ophthalmia, and that it is characterized by hemorrhages and small white, sharply circumscribed retinal foci which do not have a tendency to spread. He stated that the process is not due to emboli of pyogenic organisms in the retina, but to a chemical change in the blood dependent upon the sepsis. Probably those cases of metastatic ophthalmia which do not end in panophthalmitis are cases in which pyogenic bacteria do not enter the eyeball. Axenfeld,³ while first assistant in the eye clinic at Marburg in 1894, wrote his classic treatise on purulent metastatic ophthalmia. In about one third of his cases the disease was bilateral. In the unilateral cases he found septic emboli often deposited in the uvea, but in the bilateral cases the

retina was exclusively and predominantly infected. This simultaneous bilateral metastatic ophthalmia was usually the only demonstrable metastasis in the entire range of the carotid artery. He argued that it could, therefore, not have arisen from a general dissemination of coarse emboli-acting masses, since such masses must also have formed metastases in other places in the head and neck.

It seemed to Axenfeld most probable that in the bilateral as well as in a large number of the unilateral cases ocular infection occurred in the finest capillary branches, and that, therefore, there had been a general distribution of finely divided septic masses. Although bacteria were circulating in all branches of the carotid and ophthalmic arteries, selective localization occurred in the retina, and the orbitofacial distribution of the trunk vessel remained almost uniformly unaffected. He stated that a probable reason for the greater implication of the retina is the fact that the retinal capillaries are generally smaller than the choroidal capillaries, and that, unlike the choroidal capillaries, they are end arteries. He wrote that perhaps another reason for the involvement of certain capillaries, either of the retina or of the choroid, may have been the presence of areas of disease in the capillary walls favoring the lodgment there of microorganisms. Regarding the number of bacteria forming septic emboli, he recalled the fact that bacteria can increase in number after the death of the patient. Ulcerative endocarditis was found in about one third of Axenfeld's cases. Parsons,⁴ writing of purulent ret-

* Read at the Seventy-fourth Annual Meeting of the American Ophthalmological Society, at San Francisco, California, June 9-11, 1938.

initis, said: "It is only possible to conjecture why the retina should be so particularly vulnerable." Collins⁵ wrote: "Purulent retinitis may arise . . . from septic embolism in the retinal vessels. The retina becomes infiltrated with polymorphonuclear leucocytes, which make their way inward, collecting in large numbers between the retina and the hyaloid membrane and in the neighboring vitreous. . . . Septic emboli may also give rise to a nonsuppurative form of retinitis which is known as septic retinitis, in the same way as septic emboli may produce nonsuppurative forms of inflammation of the uveal tract."

In a more recent discussion of the subject, Schieck⁶ stated that in "simple" retinitis septica (Roth) there are no emboli of bacteria and no blocking of the retinal arteries. This disease seems to be caused by toxins, and the prognosis is more favorable than in cases of septic metastatic endophthalmitis. He wrote that usually purulent metastatic retinitis progresses so rapidly to a clouding of the vitreous and then to an involvement of the anterior part of the eyeball that panophthalmitis soon occurs. Schieck asserted that the staphylococcus was sometimes the cause of metastatic endophthalmitis following surgical interference in other parts of the body. Colonies of bacteria are found in the retinal vessels and in the vitreous. The choroid is spared probably because of its collateral circulation, but the retinal arteries are end arteries and become plugged with emboli. In discussing the question of bacteria and toxins, he remarked that if, by the term sepsis, one means the presence of germs in the blood, it is quite possible that in one case only toxic products and in another viable organisms may be present in the retinal vessels, and that in the same eye at different times there may be an alternation of these two elements. He

suggested also that the temporary state of immunity of the entire body and of the eyeball itself might be the decisive factor, and that variations in this fundamental condition might produce an exceptionally multiform disease picture. Metastatic septic ophthalmia and "simple" septic retinitis (Roth) could, therefore, be varieties of one and the same disease.

The case history which follows can properly be classified as that of a metastatic septic endophthalmitis or a purulent metastatic ophthalmia. A study of the pathologic anatomy in this case shows the presence of bacteria in the anterior chamber, the posterior chamber, and the vitreous. The retina, vitreous, ciliary body, iris, and cornea are infiltrated with pus cells. The choroid has not been involved. The ciliary body and the retina have been infected by septic embolism of their capillaries. The ciliary processes have been thoroughly disorganized and densely infiltrated with leucocytes. Toxins from the anterior chamber have infiltrated the cornea to produce a ring abscess.⁷ Ring abscess of the cornea has not been described in some of the reports of purulent metastatic ophthalmia, but it may not be of rare occurrence. In such cases the cornea is invaded by toxins and polymorphonuclear leucocytes, and a characteristic annular infection occurs, with necrosis of the posterior corneal stroma. Basil Graves⁸ has recently given an excellent description of this condition: "Ring abscess (peripheral annular infiltration), a serious purulent infiltration of the cornea, at first gray, then becoming yellow, may occur with rapid onset at the periphery of the cornea . . . in metastatic ophthalmia from focal sepsis. . . . The infiltration appears within a day in some cases, up to nearly two weeks in others, as a ring; usually complete, about 1.5 mm. wide, in most cases separated

from the limbus by an apparently clear interval which, in some cases, may be as much as 1.5 mm. wide. It is sometimes divided into two zones—an anterior in the stroma and a posterior between the stroma and Descemet's membrane. There is exudate in the anterior chamber of these cases, most of which go on to panophthalmitis. The probable explanation is that the cornea is secondarily attacked by a purulent iridocyclitis originating in local injury or in metastatic or general infections."

CASE REPORT

L. M., a male, aged 55 years, married, Italian, entered the De Paul Hospital on March 26, 1932, because of subacute suppurative otitis media of the right ear. The family history was unimportant, and his previous health had been excellent, except for repeated head colds. The general physical examination was negative. The routine ocular examination indicated no abnormality. Blood pressure and urine were normal. Stereo-X-ray examination of the mastoid regions "suggests inflammatory changes but no definite mastoiditis unless the development is very early." The patient's temperature remained normal. The leucocyte count was 6,250; Schilling differential count: Basophiles, 2 percent; eosinophiles, 4 percent; myelocytes, 0; juveniles, 0; stab cells, 8 percent; segmented cells, 47 percent; lymphocytes, 23 percent; and mononuclear leucocytes, 16 percent. The hemoglobin estimate was 75 percent. The treatment was symptomatic and palliative.

The patient was readmitted to the hospital on June 14, 1932, three months later, because of subacute mastoid inflammation on the right side. Blood examination: Leucocytes, 4,700; Schilling differential count: Basophiles, 0; eosinophiles, 1 percent; myelocytes, 0; juveniles, 0; stab cells, 7 percent; segmented cells, 68 per-

cent; lymphocytes, 21 percent; mononuclear leucocytes, 3 percent; hemoglobin, 80 percent. A simple mastoid operation was performed by Dr. T. Lawton, whose notes read—"very large mastoid with tip cells necrotic and filled with yellow pus. All other cells were involved, with a large amount of granulation tissue and pus extending into the zygomatic process. The lateral sinus was exposed and found normal." Cultures from the right ear on two examinations showed no growth after 18 hours. The general physical examination revealed some cardiac enlargement and a complete "block." The eye examination disclosed no abnormality. After an uneventful operative recovery, the patient was discharged from the hospital June 21, 1932.

On January 24, 1933, six months after the mastoid operation, the patient was brought to the hospital in a semiconscious condition, complaining of generalized pains, headache, and a sore left eye. His son stated that the patient had never regained good health since the operation on his ear, and that one week prior to his present admission to the hospital he had become acutely ill, with severe pain in his back and legs; that two days ago his left eye became inflamed, but that vision in his right eye continued good. On examination, Cheyne-Stokes respiration, cardiac fibrillation, and mental stupor were noted. During the three days preceding his death his temperature ranged from 101° to 106°F.; his pulse rate, from 75 to 105; and his respiratory rate, from 26 to 48 a minute. The urine contained much albumin, a trace of acetone, no sugar, many red blood cells, and some hyaline casts. His red blood count was 3,660,000, and his leucocyte count rose from 11,500 to 17,600. The Schilling differential count, made several times, finally gave the following picture: Basophiles, 0; eosinophiles, 5 percent; myelo-

cytes, 5 percent; juveniles, 14 percent; stab cells, 32 percent; segmented cells, 19 percent; lymphocytes, 25 percent. The estimate of blood sugar was 91 mg., and of blood nonprotein nitrogen, 60 mg. On two examinations the blood culture was positive for staphylococcus after 12 hours. The right eye appeared to be normal. Vision in the left eye was only perception of light. The conjunctiva was injected and mucopurulent secretion was present. The surface epithelium near the lower limbus was roughened. The cornea was generally infiltrated, but not steamy. The pupil was about half dilated and round. The iris was cloudy, and several yellowish-white nodules were embedded in it. Exudate covered the anterior capsule of the crystalline lens and obscured the ophthalmoscopic view of the fundus. Intraocular tension was 40 mm. (McLean). The patient died on the third day, and an autopsy was performed by Dr. R. Thompson.

Autopsy report. Considerable hypostatic congestion was present in the lungs, and a diffuse purulent bronchial pneumonia was found in the left lung. The heart was enlarged, and the mitral and tricuspid valves were covered with small, fibrous vegetation. The stomach and intestines showed no gross pathologic changes. Many fresh infarcts were present in the spleen, and both kidneys contained numerous small infarcts, with pitting and scars of the capsule and a few small abscesses. The pus in these abscesses was of a thick, creamy consistency. The liver also contained several small infarcts that were apparently of recent origin. The brain was removed, and sclerotic adhesions were found sur-

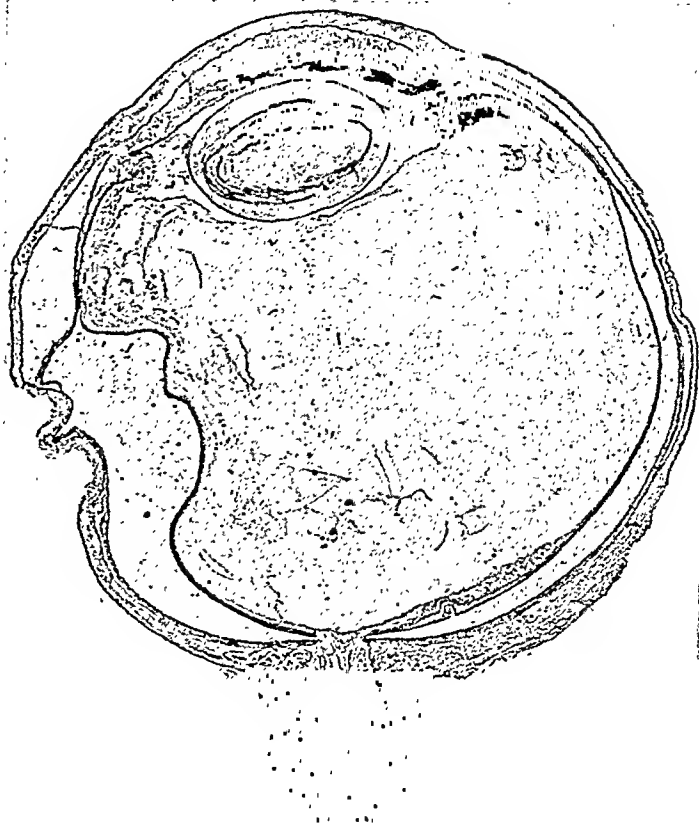


Fig. 1 (Tooker). Section through eyeball showing ring abscess of the cornea, swollen and disorganized ciliary processes, the accumulation of pus cells along the inner surface of the ciliary body and retina, particularly on the nasal side, and the considerable thickening of the retina just temporal to the optic nerve.

rounding the circle of Willis. The left eye was removed. On the left forearm, near the wrist, there was a large abscess, which was opened, releasing creamy, purulent material. The mastoid cells on the left were examined and found to be normal. Cultures from a kidney abscess showed staphylococci. Diagnosis: Septicemia.

Dr. Harvey D. Lamb, of the Department of Ophthalmology, Washington University Medical School, made the following report of the examination of the left eyeball:

Macroscopic findings: The eyeball was of normal size (fig. 1). The cornea showed a typical ring abscess (fig. 2), with the cellular infiltration involving centrally the anterior corneal lamellae. The anterior chamber was of normal

depth, and was filled with a finely granular detritus. The iris was largely necrotic, with much disintegration of the posterior pigmented epithelium. The ciliary processes were greatly swollen with inflammatory cells, and were necrotic (fig. 3). A thick layer of cellular exudate lay along the entire inner surface of the cil-

of the cornea (fig. 2) was characterized by a necrosis of the posterior layers of the substantial propria, limited peripherally and anteriorly by a thick zone of dense numbers of polymorphonuclear neutrophile leucocytes or pus cells. The necrosis of the cornea had involved practically all the posterior endothelium, but

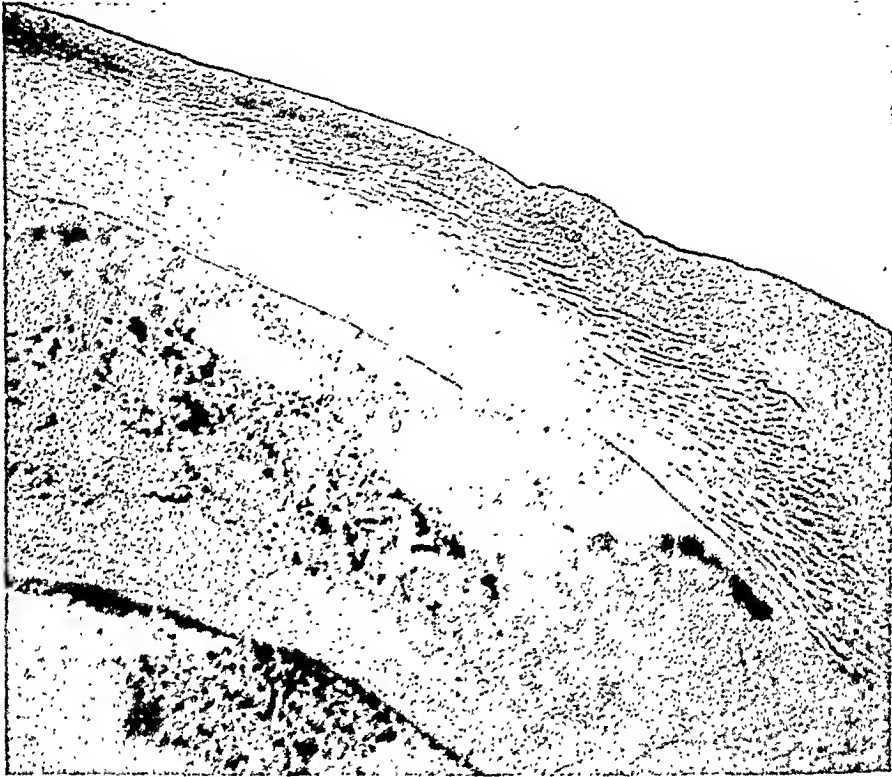


Fig. 2 (Tooker). Section through one side of the ring abscess of the cornea, with part of the anterior chamber, iris, and of the posterior chamber. In the cornea there appears the necrosis of the posterior lamellae of the substantial propria, with the anterior and peripheral zone of pus cells. In the anterior chamber there occurs the detritus from degenerated red blood cells, pus cells, groups of cocci, and loose pigmented cells from the pigmented epithelium of the iris. From the necrotic iris, loose pigmented epithelial cells have gathered in the posterior chamber.

iary body, and became thinnest over the posterior end of the orbiculus ciliaris (fig. 1). Inflammatory material extended along the inner surface of the retina, being greatest on the nasal side and posteriorly. On the temporal side and posteriorly, the retina was very much thickened by inflammatory cells. The optic papilla was but mildly swollen.

Microscopic findings: The ring abscess

had had but little effect upon Descemet's membrane. As is typical of ring abscess, the necrotic mass or sequestrum in the cornea was widest or extended more peripherally in the most posterior corneal lamellae. From this widest, posterior margin of the necrosis the latter gradually slanted anteriorly toward the corneal center. In this case, however, the necrosis did not extend to the anterior surface of the

cornea. The central area of the cornea, involving about one third of the diameter of the cornea, and including about one third of the thickness of the cornea, was densely infiltrated with pus cells. In this part of the cornea, however, Bowman's membrane was destroyed, although the nuclei of the corneal corpuscles of the infiltrated anterior corneal lamellae still stained well. Where Bowman's membrane was destroyed, the anterior epithelium of the cornea had proliferated posteriorly to fill the shallow depression remaining. The latter is the essential process in the formation of a corneal facet. The anterior epithelium was everywhere atrophic, degenerated, and thin; in a few places it had entirely desquamated. Numerous pus cells lay between the anterior corneal lamellae. Peripheral to the necrotic part of the cornea, the pus cells lay in thick layers between the corneal lamellae, pushing the latter widely apart. Posteriorly and internally the infiltration with pus cells ceased rather sharply. Anteriorly, pus cells in considerable numbers had infiltrated the anterior epithelium. Peripherally, the zone of pus cells corresponded in width to about one half the thickness of the cornea. Toward the margin of the cornea, the pus cells ceased quite abruptly, although single pus cells were fairly numerous as far as the sclera.

The detritus in the anterior chamber was derived from red blood cells. Scattered throughout it were numerous small groups of cocci, degenerated pus cells, and loose pigmented cells from the generally disintegrated pigmented epithelium of the iris (fig. 2). The chamber angles were dilated by degenerating pus cells. On the nasal side, numerous red blood



Fig. 3 (Tooker). Section through the anterior part of the ciliary body, ciliary processes, chamber angle, and base of the iris. The ciliary processes are necrotic, swollen with degenerated pus cells and fluid exudate, and ruptured internally, producing a compact mass of exudate on their inner surfaces. The anterior-internal angle of the ciliary body is swollen to a less marked degree with red blood cells and pus cells. The chamber angle is dilated with pus cells and red blood cells.

cells lay in the chamber angle, whereas on the temporal side only a few red blood cells were observed. The source of this blood was plainly the anterior end of the ciliary body just external to the ciliary processes. Pus cells from the anterior chamber had invaded the filtration network and lay thickly between the trabeculae of the latter.

In the necrotic iris (fig. 2) there could be identified degenerated nuclei of chromatophores, the sphincter pupillae and dilator pupillae muscles, and thick-walled arteries. The pigmented epithelium of the iris lay in place only behind the pupillary zone on the temporal side. Here it was thickened considerably over the normal size and presented a little ectropion anterior to the margin of the pupil. On both sides, the pupillary end of the

sphincter pupillae muscle was also carried forward slightly. This thickening and ectropion of the pigmented iris epithelium, together with the ectropion of the sphincter pupillae muscle, must have been



Fig. 4 (Tooker). Section through flat or orbicular portion of ciliary body, presenting thick exudate of pus cells anteriorly, but very few posteriorly in the adjacent vitreous.

secondary to the atrophy of the iris that terminated in necrosis of that structure.

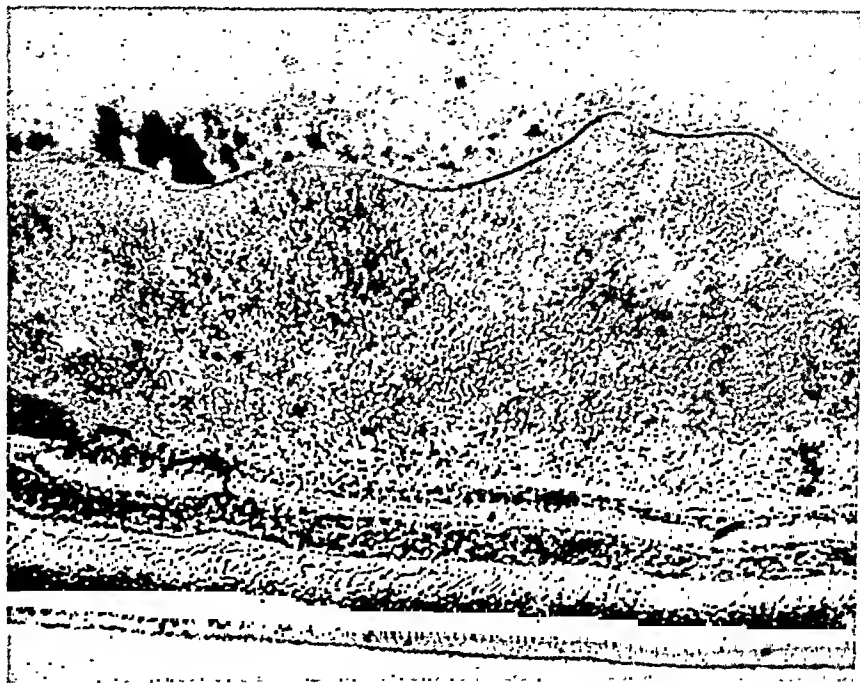
Just behind the iris, on the temporal side (fig. 2), there were numerous loose pigmented epithelial cells of the iris, intermingled with degenerated pus cells and a few small groups of cocci.

The lens exhibited some incipient cataract changes in the cortex adjacent

to the equator, as shown by swelling and segmentation of the lens fibers. The anterior epithelium presented a uniform, mild proliferation and degeneration. On the free surface of the capsule, anteriorly, lay thin layers of pigmented epithelium from the iris, and in the region of the equator, single pigmented epithelial cells from the iris, degenerated pus cells, and small groups of cocci.

The ciliary body was most unique, with a metastatic involvement of the ciliary processes as ocularly primary as that in the retina. The ciliary processes were generally necrotic and much swollen with degenerated pus cells and fluid exudate (fig. 3). For the most part, the processes presented ruptures internally, resulting in a compact mass of degenerated pus cells, red blood cells, and large clumps of cocci in the adjacent posterior and vitreous chambers. External to the ciliary processes the anterior-internal angle of the ciliary body was also intensely infiltrated with albuminous fluid, red blood cells, and pus cells. The capillaries of the ciliary processes were here undoubtedly the seat of the septic process. The ciliary body generally presented a moderate degree of edematous swelling. Small hemorrhages in the vascular layer of the ciliary body were numerous. Posteriorly, the latter contained a small number of pus cells. On the temporal side, internal to the anterior half of the ciliary body, there occurred large numbers of pigmented epithelial cells from the iris, both singly and in small groups. Between these pigmented cells there were large numbers of degenerated pus cells and numerous groups of cocci. Internal to the posterior half of the ciliary body on the temporal side, and internal to the orbiculus or flat portion of the ciliary body on the nasal side, a thick layer of loose degenerated pus cells (fig. 4) was seen. Internal to the latter, on the nasal side, occurred several

Fig. 5 (Tooker). Section through more swollen part of retina temporal to optic nerve, with numerous red blood cells, pus cells, and albuminous fluid infiltrating the inner retinal layers and large and small groups of cocci lying just internal to the internal limiting membrane of the retina.



small groups of cocci. The pus cells in the adjoining vitreous, opposite the posterior extremity of the ciliary body, were less numerous.

Of all parts of the eye, the retina was chiefly involved by the metastatic septic process. Almost every portion of the retina exhibited some degree of participation in this change, although the least amount of change occurred anteriorly on the temporal side. Here pus cells could be ob-

served coming from the small blood-vessels and mildly infiltrating the nerve-fiber layer of the retina. In the adjoining vitreous pus cells were few, except adjacent to the anterior extremity of the retina, where they had wandered posteriorly from the ciliary body. On the temporal side, posterior to the equator of the eyeball, the septic process within the retina became more pronounced. For about 6 mm. temporal to the optic nerve



Fig. 6 (Tooker). Section through part of retina just nasal to the optic nerve, where pus cells are entering the vitreous through a rupture in the internal limiting membrane of the retina.

the greatest degree of inflammatory swelling in the retina was seen (fig. 5). Between the optic nerve and the central or foveal area, however, the changes were slight. In the foveal region the retina was very irregularly swollen in Henle's fiber and the ganglion-cell layer by albuminous fluid and red blood cells. Temporal to the foveal area, the swelling was confined to the layers internal to the internal plexiform layer; this was due to infiltration with pus and red blood cells. Internal to this thickened retina, temporal to the optic nerve, comparatively few pus cells, but many small groups of cocci, were seen. On the nasal side, the septic process in the retina was more uniform. Almost everywhere on this side pus cells were seen coming from the blood vessels. The infiltration of the nerve-fiber layer with pus cells was moderate in degree from the ora serrata to the equator, then it practically disappeared behind the equator to become intense just nasal to the optic nerve. At the latter place could be observed ruptures of the internal limiting membrane by pus cells coming from the retina (fig. 6). On this side the retina was abnormally thick only near the optic nerve. Internal to the retina, between the ora serrata and the equator on the temporal side, lay comparatively few pus cells but numerous groups of cocci (fig. 5). Just behind the ora serrata, on the nasal side, the retina over a small area was necrotic and ruptured. This unused anterior end of the retina is always thin and atrophic. At this point, the purulent process was mild in degree, and therefore one is led to conclude that toxins from the numerous cocci in the adjacent vitreous had here destroyed the retina, perhaps after death. Near the

optic nerve and the equator of the eye, was slightly thickened with edematous fluid and infiltrated with numbers of loose plasma cells.

The optic papilla was somewhat swollen with edematous fluid. Its small blood vessels were seen to be the source of pus cells which were principally congregating in moderate numbers on the anterior surface of the papilla. No inflammatory cells were present in the optic nerve behind the cribriform plate, in its meninges, or in the subdural space.

Anteriorly in the vitreous, posterior and posterolateral to the lens, there were present a few degenerated pus cells and many collections of cocci. Posteriorly in the vitreous there occurred small numbers of pus cells, extensive networks of fibrin, and many groups of cocci.

SUMMARY

All the changes in the eyeball are secondary to the ocular primary foci in the retina and the ciliary processes. Emboli of bacteria must first have lodged in the capillaries of the retina and in those of the ciliary processes. It is unusual to have two distinct primary foci in the same eye, thus involving the retinal and ciliary vascular systems, although but a very small part of the latter is concerned. From the capillaries of the retina and ciliary body the bacteria easily enter the vitreous chamber. Here, by chemotactic action, they produce infiltration of the retina and to a small extent of the ciliary body with pus cells and the exudation of pus cells from the ciliary body, retina, and optic papilla into the vitreous. The ring abscess of the cornea and necrosis of the iris are, of course, secondary to toxins coming from the vitreous. As Axenfeld pointed out, a post-mortem increase of the bacteria would seem to be the most probable explanation of their large number within the eye.

COMMENT

The development of a septicemia six months after a mastoid operation would probably warrant the belief that the primary focus of infection was not the mastoid disease, and additional doubt is raised because of the fact that the cultures made from the mastoid at the time of the operation were negative. The patient was examined thoroughly, however, on several occasions, and no other focus of infection was discovered. It may be assumed, therefore, that the primary infection was probably in the mastoid cells. At the time of the patient's last illness the picture of septicemia was complete, and whatever the primary source of the staphylococcus septicemia the endophthalmitis may logically be considered to have been a complication of this septicemia. The vegetative endocarditis found at autopsy reminds one of Axenfeld's ob-

servation regarding the frequency of this condition in his series of cases. Clinically, the right eye was normal, but if the patient had lived longer this eye would also probably have become infected. The loss of the corneal epithelium in the lower part of the left cornea was no doubt due to exposure during the several days that the patient was unconscious. An unusual feature of the case was the presence of two primary ocular metastatic areas—one in the retina and one in the ciliary body of the same eye. The choroid contained some plasma cells and edematous fluid, but it was not otherwise affected by the purulent metastatic process.

I am indebted to the Laboratory for Ophthalmic Pathology, Washington University School of Medicine, for the preparation of the sections and the illustrations in this paper.

Carleton Building.

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THE TREATMENT OF GLAUCOMA WITH SPLENIC EXTRACT

E. A. MILLER, M.D.
Saint Joseph, Missouri

Splenic extract was first used hypodermically in the treatment of eczema by Docents Mayr and Moncorps, of Munich, Germany, and their work was reported by their superior, Professor Leo Von Zumbusch.¹ These investigators attempted to supply the economy of eczematous patients with the secretion which their spleens failed to produce. They assumed splenic insufficiency to be the cause of this dermatosis, for the reason that eczematous patients and splenectomized animals both have eosinophilia. By means of this treatment they were able to cure long-standing cases that had resisted every other known form of treatment. In their opinion, the eosinophilia was merely an index of some underlying cause, as yet undiscovered.

Numerous articles soon appeared in French and German literature.² The results reported varied, but none of the writers were enthusiastic. This is due to the fact that clinicians obviously had not yet learned that the therapeutic efficacy of an organ extract is seldom, if ever, expressed by the number of grams represented by each cubic centimeter. Until a biologic standard is established for splenic extract, the results obtained by one clinician should not be contrasted with those reported by another unless both writers have used an extract made by the same laboratory, and, better still, from the same batch. The French writers especially, emphasized the fact that they use an extract of extremely high concentration.

In this country, Paul³ claimed that an

utes after the first injection; that some cases required no further treatment; and that most patients permanently recovered in one or two months. In one case, deafness, "caused by eczematous thickening of the cutaneous layer of the tympanic membrane," disappeared together with a similar involvement of the skin of the external ears. Three women's dysmenorrheas disappeared while being treated for eczema with splenic extract; "the annihilation of an allergic obstruction of the cervical canal, similar to the removal of such obstructions in the bronchioles in cases of asthma," is the explanation offered. In numerous cases, gastric disturbances, anorexia, and inability to tolerate certain foods disappeared; "coincident to recovery from 'eczema of the gastric mucosa' and eczema of the cutaneous surface" is the reasonable explanation. This observer appropriately asks: "Since eczema of the skin occurs without gastric involvement, if the gastric mucosa alone was the site attacked, could a gastro-enterologist make such a diagnosis?" "Such unlooked-for results," Paul states, "prove that eczema, like syphilis, is more than skin deep."

In consequence of a patient's permanent recovery from migraine while under treatment for urticaria, Paul concluded that the cephalalgia must have resulted from the pressure of the allergic edema of the brain against the rigid cranial walls. Later it occurred to him that a duplication of this phenomenon occurred in glaucoma, the only difference being that the angioneurotic edema, developing within the eyeball, meets the resistance of the inelastic sclerocorneal envelope.

The above theory sounded fantastic

when first expounded to me by this dermatologist, and my suspicions were intensified when he stated that this idea had been thrust among his meandering thoughts by his subconscious mind, when almost asleep after retiring. It happened that, at this time, I had a patient with glaucoma who was not responding to eserine, ephedrine, and pilocarpine, and would not submit to operative interference. I consented to this therapy after being thoroughly harangued by my colleague, as to how perfectly sure he was that glaucoma was simply intraocular angioneurotic edema, and how he had seen similar swellings on the cutaneous surface vanish in 20 minutes. He said that, at the very worst, the treatment could merely fail to benefit the patient, and that his statements were based on the treatment of over 300 cases during the preceding six years. I knew, moreover, that the patient would go blind if something was not done.

Magitot believed glaucoma to be a simple, or angioneurotic, type of edema within the eyeball. He thought this edema, in turn, was due to excessive capillary permeability. I gained this information from an exhaustive monograph by Luedde⁴ which confirmed what I learned from Paul. Since Magitot's papers⁵ appeared in 1929, and Paul had begun to treat dermatoses with splenic extract over a year previously, it is obvious that the idea that glaucoma is an intraocular edema must have developed in Paul's mind in the manner described by him. Had he merely learned it by reading Magitot's papers, he would have immediately suggested the trial of this treatment, instead of waiting five years before bringing it to my attention. It is needless to point out that by an attempt to deal with glaucoma as an allergic disease in the orthodox way, irreparable damage would be done while dawdling with skin tests and elimination diets.

Each day this patient, therefore, went to Paul, received his injection, and then came to me for observation of results. I am frank to admit that I hesitated to give the voluminous doses myself.* This patient had been taking 4 to 12 aspirin tablets every night and trying to sleep in a rocking chair because his pain increased on lying down. Immediately after the first injection there was a marked decrease in pain and reduction in intraocular pressure. Injections were given daily, and in five days the pain had completely disappeared. Treatment was started June 28, 1934, and the patient had fully recovered by July 30, 1934. During this time he received 12 injections. Within the following five months he had several mild recurrences, each of which quickly disappeared under one to three additional injections. The glaucoma involved his left eye, and he also had a cataract in his right eye. This patient was presented before the Buchanan County, Missouri, Medical Society on October 3, 1934, and a description of his case was subsequently published.⁶

The second case was of a 74-year-old woman, a former brothel keeper, about to die with cardiorenal disease, accompanied with severe edema. Paul gave her some of the first injections and she completely recovered from her glaucoma before her demise.

Such results completely destroyed my natural resentment to receiving instructions from a dermatologist, and thereafter I gave the injections of splenic extract myself. While the first treatments, given without Paul's supervision, were not unaccompanied with misgivings, I soon learned—as claimed by my colleague—that splenic extract is as harmless as it is effective. In arriving at this conclusion, I was not unmindful of Paul's statement

* It was 20 cubic centimeters of 40-percent splenic extract (Armour's).⁶

that he had treated over 300 patients for cutaneous and respiratory allergic diseases, during a period of over six years, without a single unfavorable reaction of any kind, before seeking my aid on account of his inability to diagnose glaucoma and evaluate the effects of this treatment.

Including the two cases just reported, I have treated 22 patients with splenic extract to date. Two of these showed marked decrease in tension, before deciding to place themselves in the hands of other ophthalmologists who performed iridectomies. In a third case, a peripheral iridectomy was performed for the reason that the increased tension returned as soon as treatment was discontinued, and despite the patient's having received numerous injections. The ultimate result, in this patient, was restoration of normal vision and tension.

Four of these patients had cataract with secondary glaucoma. Their prompt response to splenic extract proved that secondary glaucoma is amenable to this treatment. The advantage of reducing the tension in such cases before operation is obvious. Two patients presented themselves so late that partial optic atrophy was already present. A decrease in intraocular tension promptly followed treatment in both; but, of course, this did not clear up the scotomata in their fields.

The right eye of one patient had been operated on for glaucoma by a competent ophthalmologist, several years before I was consulted. Vision for form and light only was retained. The tension in the left eye, for which the patient consulted me, promptly subsided under splenic extract, and she has had no return of symptoms for two years. One patient's syphilis did not militate against prompt recovery under this treatment. Another patient's glaucoma quickly yielded to treatment, despite arterial hypertension and obesity.

A patient with swollen lenses, secondary glaucoma, and diabetes, who reacted poorly to eserine, ephedrine, and pilocarpine, responded immediately to splenic extract, although tension was permanently controlled and vision remained normal only after prolonged treatment.

A few particles of steel in a man's eyeball, acquired during the World War, caused a chronic secondary glaucoma. Two ophthalmologists advised enucleation. Splenic extract keeps the tension at, or near, normal if constantly used. He is a traveling salesman, carries a supply in his grip, and receives injections from physicians in the towns he visits. A patient who developed glaucoma after smallpox, completely recovered after four injections. One patient's tension slightly increased after the first injection. The second treatment reduced it to normal. She came to me very recently, and at this date the outlook is that she will completely recover under a few injections. This case is an illustration of Paul's "Jahrisch-Herxheimer-like reaction," hereafter described.

A patient, whose tension remained normal after several injections, had a recurrence each time he went on a spree. This case supports Paul's claim that alcoholic beverages completely nullify the effects of this treatment. In such cases the ingested alcohol neutralizes the secretion of the patient's own spleen after treatment has been discontinued. A case fully illustrating this fact is described in one of Paul's papers.⁷ Three patients discontinued treatment too early to enable me to decide if they had completely recovered. In each case, the tension came down promptly after the first injection. Fear of the hypodermic needle may have been the reason for their disappearance.

At the time Paul gave his first injection of splenic extract, February 25, 1923, methods of fractional extraction and the importance of biologic standardization

were not generally known. For this reason, most clinicians, and among them Paul, did not understand that an ampoule might contain an extract that was therapeutically worthless, despite its label's statement that it was obtained from a given organ. To use this dermatologist's own language, "It was owing to the fact that I reasoned, 'Splenic extract is splenic extract, and if I do not get good effects it is merely because I have given an inadequate dose!' Therefore, as a result of my ignorance of the possible absence of the curative fraction, I learned that the extract I was using was not only harmless but highly potent if given in a seemingly large quantity."

By cautiously increasing the amount injected, this clinician concluded that a dose of less than 20 c.c. is often ineffective, though 30 c.c. will cause no untoward reaction. He also learned that children seemed to have a tolerance for it out of proportion to their age. A newborn child will have no bad effects from a dose of 3 c.c.; 5 c.c. can be given to a 3-months-old baby, and a full adult dose to a 15-year-old child.

The extract we use is probably the weakest on the American market; it is the one used in the very beginning by Paul, and thoroughly deproteinized in order to obviate allergic shock. The voluminous dose required is fully compensated for by its clinical effects. We use a 10-c.c. Luer-lock syringe to prevent the needle from slipping during the injection, and a 22-gauge needle for the reason that one with a smaller bore requires too much time to draw up and expel the voluminous dose. Ten cubic centimeters is given in each upper arm because an edema, lasting several days, sometimes ensues if the entire 20 c.c. is given in one arm. Paul has given the extract four times intravenously; in three cases there were no bad effects, but in the fourth cases, a severe general re-

action, beginning one hour after the injection and lasting five hours, ensued. The patient made a complete recovery. An injection of 10 c.c. into each buttock prevented a patient from lying on her back the two following nights.

Injections are given at 48-hour intervals, unless symptoms recur sooner; in rare cases it may be necessary to shorten the interval to every 12 hours. As soon as symptoms indicate that the patient has fully recovered, a few injections are given at the usual 48-hour interval, as an insurance against recurrence, and then the time between the treatments is progressively increased, because we have learned this diminishes the likelihood of a return of symptoms.

During, or immediately after, an injection, a patient may faint. This is due to fright more often than to pain. Rarely a transient feeling of vertigo may supervene. For these reasons the patient should be either placed in the recumbent position, or seated on a table where such a position can be readily assumed. Elevation of the feet and a little time are all the treatment needed in any case. Indulgence in alcoholic beverages should be strictly forbidden. Careful inquiry should be made as to the nature of any liquid medicine the patient may be taking. The ingestion of even the smallest amount of alcohol definitely neutralizes the therapeutic effects of splenic extract.

Paul describes what he conveniently terms "A Jahrisch-Herxheimer-like reaction." This consists of a marked intensification of symptoms following the first and, perhaps, also the second and third injection. It is a favorable sign, for such patients almost invariably recover. According to his statistics, based on over 600 cases to date, it occurs in a little less than two percent of cases. In five cases of angioneurotic edema, in all of which there was recovery, this phenomenon occurred

in only one case. He points out that it is the one thing he greatly fears in glaucoma, for if an injection of splenic extract would produce such an effect in the eye, the patient's only hope would be immediate operative interference.

This treatment is in its infancy; only the results obtained by a large number of ophthalmologists, over a considerable period of time, will establish its therapeutic value. Laboratory study, for the purpose of trying to discover the principle underlying the action of splenic extract, and, if possible, to establish a biologic standard for it, should be undertaken.

CONCLUSIONS

1. Primary glaucoma is an angioneurotic edema within the eyeball, just as migraine is an angioneurotic edema of the brain. This is proved by the prompt relief of symptoms and reduction of intraocular pressure following the injection of a deproteinized extract of hog spleen.

2. The only reaction to be feared from this treatment is an intensification of symptoms, sometimes following an injection. Such reactions have been observed in cases of asthma, angioneurotic edema, urticaria, and eczema.

3. Continuation of this treatment will result in permanent recovery in most cases.

4. The danger of opening the eyeball under high tension is greatly reduced in cases demanding operation despite this treatment.

5. Therapeutic effects are not in proportion to the degree of the splenic extract's concentration, and favorable results can be obtained only if the extract happens to contain the curative element.

6. There is a crying need for laboratory investigation which might discover the physiologic action of this remedy, as well as a means of biologically standardizing it.

Kirkpatrick Building.

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NOTES, CASES, INSTRUMENTS

A SPECIAL SOLVENT DISPENSER FOR THE REMOVAL OF ADHESIVE-PLASTER DRESSINGS

WARREN D. HORNER, M.D.
San Francisco

The removal of adhesive plaster from the skin is always a disagreeable task, particularly from a sensitive area like the face. In eye dressings this discomfort may cause squeezing, crying, or loss of confidence, particularly in children. It can be easily prevented by using a few drops of adhesive solvent, providing the solvent is at hand on the dressing tray. In my experience it usually is not. Benzene sponges are not efficient. Moistened applicators are better, but are seldom at hand. Application of solvents by a medicine dropper cannot be controlled, since the caliber of the pipette is too large to handle thin fluids.

It occurred to me that a solvent dispenser might be devised which could be conveniently kept on the dressing tray ready for use. After considerable experimentation with trial designs and various solvents, I would like to present the model illustrated. This consists of a stainless-steel container of convenient 3-ounce size and shape which is provided with a smooth spout containing a sensitive needle valve. It will deliver a thin solvent in just the right amount to separate adhesive from the skin, yet will not spill excess fluid into the eye nor down the face. It is equally effective in removing ordinary adhesive or the new cellophane Scotch tape.

The valve may be adjusted for different rates of flow and different solvents by turning the valve screw, and may be completely closed for carrying. The rate of flow of the solvent is faster when the dispenser warms from the hand and can be varied at will. Squeezing the sides of the

dispenser, as one would an oil can, also increases the flow momentarily.

As to solvents, I have used benzene, acetone, ether, and carbon tetrachloride. Ether is undoubtedly the least efficient and is a torture to anyone who has recently had an ether anesthetic. Benzene is inflam-

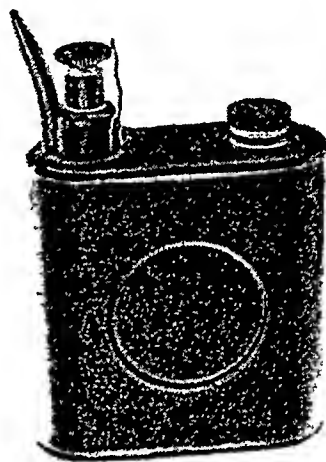


Fig. 1 (Horner). Solvent dispenser.

mable, burns the skin, and has an offensive odor. Acetone is better but is a powerful solvent and ruins duco or paint finishes, and is for this reason undesirable. Carbon tetrachloride is neither irritating nor inflammable and is our choice of solvents. Its odor may be disguised by the addition of one drop of oil of rose to the ounce. Carbon tetrachloride, which resembles ether, is not harmful in the amounts necessary to remove dressings. The commercial solution is quite inexpensive.

The solvent dispenser may be obtained from the Trainer and Parsons Optical Company, 228 Post Street, San Francisco, which has given me valuable technical aid in the development of the necessary experimental models.

490 Post Street.

PRISM SCALE FOR USE AT 50 CENTIMETERS*†**

CONRAD BERENS, M.D.
New York

Description of prism scale. This prism scale was constructed because of the desire to develop an indestructible scale the

markings of which were clearly visible and which could be used to measure the strength of strong prisms. It also seemed desirable to overcome the important disadvantage of most scales in that the distance they are constructed for is beyond the focus of many lenses to be tested. Results are often inaccurate with other

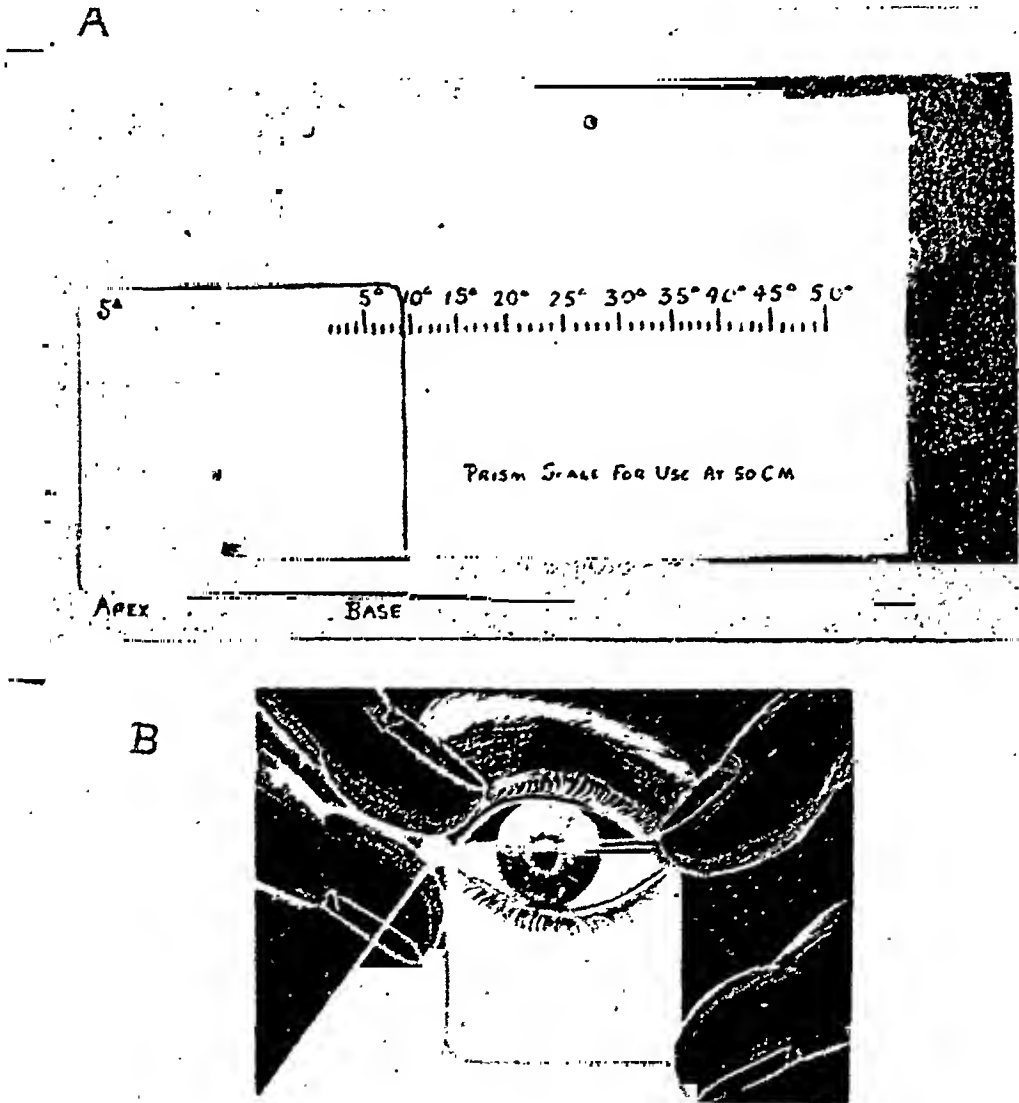


Fig. 1 (Berens). A, a prism scale for use at 50 centimeters. B, method of using the scale.

* Presented before the American Ophthalmological Society, San Francisco, California, June 9, 10, 11, 1938.

† Made by David W. Mann, Lincoln, Massachusetts.

** Aided by a grant from the Ophthalmological Foundation, Inc.

scales because no simple method for fixing the distance at which the scale should be used has been provided.

The prism scale (fig. 1A) is constructed of black bakelite, the actual scale and figures are of baked white enamel. A red-

enamel horizontal line serves as an indicator. A small metal cylinder is attached to the end of the distance cord, which may be wound around two pegs on the scale when not in use.

Method of using the prism scale. The scale should be well illuminated and placed 50 cm. from the observer, with the surface so arranged that the visual line is perpendicular to the scale. The metal cylinder at the end of the cord is placed against the prism or prismatic lens to be studied, which is held before the eye as depicted (fig. 1B). The displacement of the vertical line is read in prism diopters on the scale above the horizontal red line.

Advantages of prism scale. The advantages of this prism scale are that: (1) it may be used to test prisms of from .5 to 50^Δ, (2) it is especially useful because many lenses have a focal distance shorter than 1 meter, (3) the 50 cm. cord facilitates the accurate measurement of the prismatic deviation and, (4) bakelite is comparatively indestructible, light in weight, and easily cleaned.

35 East Seventieth Street.

IRIDOCAPSULOTOMY SCISSORS*†**

CONRAD BERENS, M.D.
New York

These iridocapsulotomy scissors, a modification of the scissors previously de-

* Presented before the American Ophthalmological Society, San Francisco, California, June 9-11, 1938.

† Made by the V. Mueller Co., Chicago, Illinois.

scribed,¹ have been found satisfactory for cutting secondary membranes and in performing iridocapsulotomy.

Description. The thin, narrow blades of the scissors are 14 mm. in length, and slightly curved. They are similar in shape to the Noyes scissors, except that both blades are pointed, and the spring cutting action is different than the scissors action of the Noyes instrument (fig. 1). The stationary blade is extended by an octagonal handle 14 cm. long; the second blade of the instrument is moved by downward pressure on a broad, flat arm, 48 mm. in length, which is slightly grooved at the end, so that the index finger will not slip while using the scissors. A strong spring is attached beneath this arm, and is carried across to the stationary handle, close to the blade joints. At this end, the spring has a small rectangular cut, enabling the shaft to slide over a small wedge when activating the arm. In the iridocapsulotomy scissors, which were presented in 1926, the movable arm is joined by an additional arm which penetrates through the center of the stationary handle. Both instruments have the duck-bill action and are always closed unless pressure is exerted on the arm, thereby making it easy to introduce and manipulate the scissors in the anterior chamber without muscular tension.

Method of using iridocapsulotomy scissors. After making a subconjunctival incision into the anterior chamber and perforating the membrane or capsule and

** Aided by a grant from the Ophthalmological Foundation, Inc.



Fig. 1 (Berens). Iridocapsulotomy scissors.

iris with a narrow hollow ground keratome,² the iridocapsulotomy scissors, with the blades closed, is entered into the anterior chamber. The blades are opened slightly upon reaching the opening made by the keratome in the membrane, one blade is passed under the membrane, the other remains on the surface of the membrane, and the blades are then permitted to close.

Advantages. (1) The iridocapsulotomy

scissors can be used through a smaller opening than can the de Wecker scissors, (2) the blades of the scissors completely fill the opening in the sclera made by the narrow keratome, thus preventing unnecessary loss of vitreous, (3) the scissors are more easily manipulated than the de Wecker scissors or the iridocapsulotomy scissors previously described.

35 East Seventieth Street.

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SUTURE MATERIAL FOR OCULAR OPERATIONS*

DANIEL B. KIRBY, M.D.
New York

The author has devised new sutures for use in intraocular surgery, particularly in cases of cataract for conjunctival apposition. They have been used also for plastic cases. Another needle is being designed for sclerocorneal sutures. They are made by Davis & Geck Company, and are known as Product No. P 256 Special Eye Sutures. This product comprises a group of three individual sutures, each wound on its own reel, three reels being contained in one tube. Each suture consists of black

braided silk, size Six-0, length 18 inches, affixed to a specially designed one-quarter-circle cutting point atraumatic needle. The author has been pleased with the sutures. The needles are small, slender, sharp, have cutting edges, and do not turn in the needle holder. The suture material is single armed, thin but sufficiently strong. It is easily handled and tied and removed. The sutures can be supplied in double-armed needles. The product is economical, supplying as it does three sutures for use in the individual case, but being of sufficient length to be drawn through, cut off after being tied, and used again in other cases after resterilization. The sutures are 18 inches long, sufficient for three or four cases.

780 Park Avenue.

* Described before the American Ophthalmological Society, at San Francisco, California, June 9-11, 1938.

SOCIETY PROCEEDINGS

Edited by DR. H. ROMMEL HILDRETH

NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

March 15, 1938

DR. EDWIN B. GOODALL, *presiding*

RECENT ADVANCES IN CHEMISTRY AS RELATED TO OPHTHALMOLOGY

DR. KARL MEYER of Columbia University said, after a general introduction about the role of chemistry in ophthalmic research, that he was dealing with two main problems, the metabolism of the lens and cataract, and the fluid exchange of the eye. A review was given of galactose cataract and dinitrophenol cataract. The hypothesis was put forward that the lens *in vivo* might be an obligatory anoxybiotic tissue, in which oxygen and oxidation cause denaturation of the proteins composing the lens.

The recent literature on fluid exchange of the eye was discussed. The evidence for the secretory origin of the ocular fluids was presented. The isolation and composition of a high molecular polysaccharide acid in vitreous and aqueous humor was stressed as being incompatible with the dialysis theory. Data on quantitative determinations of hexosamine in the aqueous humor of rabbits and cats were given. A report was made of the influence of eserine, which definitely increased the hexosamine and protein concentration of the aqueous; of atropine, which gave varying results; and of diosmin, which had no effect. A few analyses were given of the hexosamine content of glaucomatous and nonglaucomatous human aqueous punctates. In the cases investigated, including one of acute glaucoma, no increase in hexosamine or protein content was found. This finding

seems to oppose the vascular origin or the histamine theory of the increased tension.

SOME PHYSIOLOGICAL AND ANATOMICAL ASPECTS OF THE CORNEA AFFECTING ITS PATHOLOGY

DR. THEODORE L. TERRY read a paper on this subject which was published in this Journal (February, 1939).

Virgil G. Casten,
Recorder.

NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

April 12, 1938

DR. EDWIN B. GOODALL, *presiding*

ANISEIKONIA REVIEWED TO DATE

DR. WALTER B. LANCASTER read an interesting paper on the above subject. The following is an outline of the paper:

Causes: Anisometropia, asymmetrical convergence, unknown causes.

Consequences: (1) Effect on perspective, space perception, orientation (tilting plane). (2) Symptoms—namely, those of eyestrain—are like eyestrain from other causes.

Objections: (1) Any benefit from isekonic lenses is due to suggestions, psychotherapy. (2) Anisophoria is the probable explanation. (3) Since asymmetrical convergence produces large differences in size of the retinal images without discomfort, probably other forms of aniseikonia are taken care of without symptoms.

Reply: (1) Many, perhaps most, cases of eyestrain have a neurotic factor. Aniseikonia is no exception. That is not the

whole story, however. (2) Anisophoria is a phoria which varies in different directions of gaze like a paresis. A method of testing without changing the direction of gaze still shows the aniseikonia. Also the tilting plane cannot be accounted for by anisophoria though easily explained by aniseikonia. (3) It is easy to show on the Ames haploscope that asymmetrical convergence is automatically compensated because the optical image of the adducting eye is made larger by just the amount needed to correct the inequality of the retinal images which would naturally follow from asymmetrical convergence. It is a striking example of compensation. There are other ways of compensation that we do not know so much about. We know that some of them, when overtaxed, produce eyestrain that is relieved by eikonic lenses. Much harm has been done to the subject by overenthusiastic claims.

The steady progress that is being made by The Dartmouth Eye Institute in solving the many problems that arise from investigating the phenomena of binocular vision is convincing reason for confidence in their work.

SOME ASPECTS OF VISUAL ORGANIZATION

DR. KURT KOFFKA from the Department of Psychology, Smith College, Northampton, Massachusetts, read an interesting paper on the above subject. Dr. Koffka's problem was the connection between retinal stimulation and the central processes that correspond to vision. His thesis was that this connection is not a point-to-point coördination but that the total stimulus pattern supplies the boundary conditions for the organization of the central processes.

Dr. Koffka illustrated his thesis by a number of examples. He began with the pseudofovea of hemianopsia, relying on experiments by W. Fuchs (carried out

in the Frankfurt Institute of Gelb and Goldstein), which he has briefly discussed in his "Principles of Gestalt psychology" (Harcourt, Brace, 1935, on pp. 202ff.). He discussed the Aubert-Foerster phenomenon (see, for example, Ellis Freeman: What does a test of visual acuity measure? *Arch. of Ophth.*, 1929, v. 2, July, pp. 48-56), and added an experiment by Gelb discussed in his "Principles" on page 205, and one or two others. He then introduced the distinction of homogeneous and inhomogeneous stimulation and described in accordance with Metzger's experiments (see his "Principles," pp. 126ff.), that not all inhomogeneities are equally effective and turn to the laws of organization. Finally, he applied the same point of view to problems of eye movements (accommodation and fusion; see his "Principles," pp. 311 and 314ff.), and he ended with the problem why the objects appear at rest while we move our eyes.

Virgil G. Casten,
Recorder.

SAINT LOUIS OPHTHALMIC SOCIETY

April 22, 1938

DR. ROY E. MASON, *president*

MANAGEMENT OF GLAUCOMA FOLLOWING CATARACT OPERATION

DR. B. Y. ALVIS read a paper on this subject which is published in this issue of the *Journal*.

Discussion. Dr. William H. Luedde said because it is the problems of post-operative glaucoma which are under discussion, it appears reasonable to base conclusions on what can be demonstrated by examination of the ocular tissues. However, the percentages quoted concerning the incidence of this complication

(1 percent by Collins, 0.64 percent by Knapp, 2 percent by DeGama Pinto) may remind us of the 2 percent of malignant glaucoma reported by Von Graefe. These were also cases of postoperative glaucoma. They were in patients in whom the state of "absolute glaucoma" supervened after iridectomy for the relief of a previously existing glaucoma. The reaction to iridectomy in this special group resembles that reported by Kirwan after simple iridectomy for glaucoma in the eyes of patients suffering from epidemic dropsy. These were invariably made worse. These experiences seriously raise the question of the relation of the colloids of the blood plasma to the local ocular disease; a question not yet answered, but challenging further study. Kirwan found that filtering scars as provided by the trephine operation were successful in reducing intraocular hypertension in his cases. In two of his own patients the usual cataract extraction was complicated during the healing process by a slight iris entanglement at the extreme angle of the corneal wound with the formation of a filtration bleb under the conjunctiva. When he learned later that the brother of one of these patients had a cataract extraction followed by glaucoma and the sister of the other patient had become blind from glaucoma following cataract operation, he was not so sorry about whatever postoperative accident caused the iris prolapse, because both of the patients have retained vision of 20/20 or better for many years. This occurrence brings up the consideration of the statement by Dr. Alvis that a perfect operation for cataract does not seem to confer immunity from postoperative glaucoma, nor does it necessarily follow a less brilliant surgical technique.

Sometimes the cause of the secondary glaucoma is obvious, as it was in a young girl in whom absorption after discission

of a soft cataract was so perfect that excellent vision (20/20+ with correction) was achieved, but in one quadrant the iris had been doubled back upon itself by the first swelling of masses of lens substance in the anterior chamber. Gradually, a quiet increase in intraocular pressure began in this eye. The patient, with a curious mental twist, refused any further surgical correction and that eye became totally blind with glaucomatous atrophy. Surgical measures involving the iris usually can open only a small segment of the circumference of the iridocorneal angle, hence the postoperative use of miotics appears just as reasonable as for preoperative care in glaucoma. He has never sympathized with tests made to see if the patient could get along without any treatment after operation when instillations of a miotic at bedtime or twice daily might promote the safety and well being of the eye. For reasons noted in his recent résumé before this society, he always uses a strong miotic immediately after stronger solutions of epinephrin and has had no reason to regret it.

Inclusion operations appear to defy fundamental surgical principles in spite of their recorded success. Cyclodialysis, which offers no external or episcleral drainage, has never made a strong appeal to him. Since Ridley has demonstrated experimentally that the corneal limbus may be a factor in transfusion of fluids, he has secured striking general conjunctival edema when excision of corneal tissue was combined with iridectomy. Similar results were reported by Conrad Berens and the success of Otto Barkan's gonioscopic trabeculotomy may be explained in that way. Does Dr. Alvis use the bubble of air to raise up a cornea that collapses after cataract extraction? He has steadily avoided additional instrumentation in such cases and has failed to see any results that might indicate a greater

liability to postoperative glaucoma in such cases.

If, as was suggested, a low-grade infection and congestion can be caused by a tag of vitreous caught in the wound, then, also, the same reaction might be caused by extraocular foci of infection which apparently can produce these phenomena in eyes that have not been traumatized—surgically or otherwise. Thus, it would appear that every precaution, such as the preoperative elimination of focal infections, and so forth, may be properly applied to this class of cases as well as in any undertaking of intraocular ophthalmic surgery. This has been well demonstrated by Dr. Alvis's excellent résumé of his experience in postoperative glaucoma.

Discussion. Dr. B. Y. Alvis stated that he had used a bubble of air in raising a collapsed cornea and it may or may not have been advantageous. It made him feel better to close the lids with the wound margins already coapted.

REMOVAL OF INTRAOCULAR FOREIGN BODY AFTER 18 YEARS

DR. F. E. WOODRUFF reported that 18 years ago, on October 8, 1919, Roland M., aged eight years, presented himself with the following history: About four months previously he had been shot in the right eye with bird shot. There was no history of pain nor inflammation after the injury. The lens was completely opaque. A small scar in the cornea, and the iris wound, showed the path of the foreign body. Light perception and projection were good. No examination of the fundus was possible because of the opaque lens.

X-ray examination and localization showed a small foreign body in the globe, 2 mm. below the horizontal plane of the cornea, 11 mm. to the temporal side of the vertical plane of the cornea, and 15 mm. behind the center of the cornea.

The father was advised to bring the boy in from time to time to determine further action and treatment.

The patient did not return until March 31, 1931, reporting that he had not been under care or treatment since the injury in 1919. At this time (that is, 1931) the eye was deviating outward, light perception was good and projection only fair. The fellow eye was absolutely normal. Some of the lens substance had been absorbed and there was a fairly dense membrane with some iris adhesions. A needling was performed on April 2, 1931. The remaining lens substance absorbed but a second needling of the capsule was necessary. The membrane retracted back of the iris.

In 1933 the patient was reexamined. The right eye was quiet and the left eye, measured for a +0.50 D. cyl. ax. 90°, obtained normal vision. There were no symptoms whatsoever.

On September 15, 1934, the patient reported some difficulty with the right eye but this proved to be only a slight conjunctivitis which subsided under local treatment.

On September 21, 1937, the patient again presented himself with the history that for the last two years he had had intermittent trouble with his left eye, which was his good eye. There was some squinting, some disturbance of vision on the street and in picture shows. The eye was tender on pressure. He came for examination at this time not because of trouble in the eye but because of his wife's insistence (a doctor's daughter). The good eye was slightly irritable and tender but no impairment of vision could be demonstrated. X-ray examination of the right eye revealed a foreign body 11 mm. below the horizontal plane of the cornea, 3.5 mm. to the temporal side, 11 mm. behind the center of the cornea. On September 28, 1937, a scleral incision

was made at the site as localized. One lip of the wound was depressed and the shot fell into the spoon. The patient made an uneventful recovery.

This case is reported because of the length of time, 18 years, that the shot was in the eye before giving rise to symptoms referable to the foreign body. Since the foreign body was lead shot he thought that one could afford to wait at least for a time. The position of the shot in 1919 was such that it would have been a miracle if one had succeeded in getting it from its location at that time.

The gravitating of the shot into the neighborhood of the ciliary body was probably the cause of the disturbance of vision and slight tenderness experienced at the time the patient last presented himself. This may have been a sympathetic irritation which might have led to a sympathetic inflammation and loss of the good eye. Fear of this was the reason for interference.

Discussion. Dr. William F. Hardy said that Dr. Woodruff is to be congratulated on his ability to remove a nonmagnetizable foreign body from the vitreous without the use of forceps and consequent manipulation and disturbance of the vitreous. This fortuitous circumstance was occasioned by the change in the position of the foreign body from its original position to that 18 years later which brought it in close apposition to the sclera.

The history of foreign bodies in the vitreous is a rather sorry one. The seriousness varies, depending on a number of factors: (1) the size and shape of the penetrating substance, (2) its chemical nature, (3) the velocity with which it strikes the eye, (4) the site of penetration, (5) the presence or absence of infection, (6) the secondary changes which ensue.

A small object of inert chemical na-

ture hitting with moderate velocity, producing a clean-cut portal of entry, penetrating the sclera behind the ciliary body, and sterile in nature, should produce the least serious type of intraocular foreign body. Few fill all these requirements and the danger to the eye varies with each deviation therefrom.

Because of their size and shape some foreign bodies immediately and completely demoralize the ocular tissues. Others by their chemical nature produce so much reaction that the eye must eventually be destroyed. Lead, glass, wood, and stone are more or less inert. Copper, particularly, and iron are chemically active and destructive; both undergo chemical changes with deposition of their salts and staining of the tissues. Copper may lie dormant for a while and then may at any time start activity. A piece of copper within the eye is a veritable sword of Damocles hanging over the head of the unfortunate host. In favorable cases encapsulation of the foreign body may take place, which, in a sense, is a protective measure, but on the other hand makes removal more difficult and retinal detachment more likely.

Other factors being equal, a body of low velocity should produce less trauma than one of high velocity. The latter is likely to produce a double perforation, the outlook of which is very grave. Penetrations through the cornea usually mean traumatism to the lens. Objects lodging in the lens offer a good visual prospect, as the resulting cataract and foreign body may be successfully removed at one sitting. The presence or absence of primary infection is of the greatest importance. Fortunately, small particles of metal are usually sterile, due to the heat generated by the impact which gives rise to them. Many eyes are marked for destruction within 48 hours, due to the violent infection carried by the penetrating body.

One point which is always the subject of debate is the method of extraction of a magnetizable object: whether by the anterior or posterior route; whether through the original penetration or through a surgical one. This can apply usually only to foreign bodies in the vitreous chamber. In some cases a foreign body in the anterior segment can be removed with less trauma and manipulation through a surgical wound. As the foreign body in this case report was inert, any further discussion of these points is unnecessary.

The points of greatest interest in Dr. Woodruff's case are the following: (1) the length of time the foreign body lay dormant. This was due to its inert chemical nature; (2) the change in position making removal feasible; (3) the accurate localization; (4) the accuracy of the incision for removal; (5) that it was not encapsulated nor held by adhesions, and that it was in juxtaposition to the sclera, allowing it literally to drop into the operator's hand.

As to the presence of sympathetic irritation, he is a little skeptical unless the essayist has further data which he did not bring forth in the case report.

Dr. Roy Mason mentioned that there were a few cases in which he had removed nonmagnetic intraocular foreign bodies successfully, though the operation failed as far as sight was concerned. He had been successful in two vitreous cases, though there was a complete detachment of the retina following the operation. We are seeing more cases of nonmagnetic foreign bodies; new metals are being used, alloyed metals which are nonmagnetic. He believes our specialty has been neglectful in not giving a little more study to the removal of nonmagnetic foreign bodies.

BILATERAL GLIOMA

DR. M. L. GREENE presented a case of bilateral glioma in a baby four months

of age. One eye was in the glaucomatous stage, the other eye was preglaucomatous. There was no evidence of calcium deposits in the X-ray pictures of either eye. X-ray treatment of 400 R. was given to the right eye, which was then enucleated. There was no evidence of any cell destruction as a result of the X-ray treatment; in fact, an unusual number of mitotic figures were present. The left eye received a total of 1,200 R. and is still under observation, the tumor being very much smaller than when first seen. Two other cases of unilateral glioma were presented and discussed. There were no unusual features to these cases and they presented no calcium deposits on X-ray examination.

Discussion. Dr. Jule T. Elz said the eye enucleated in this case was placed in bromo-formol in order that some of the newer impregnating methods might be used, which he believes are necessary for a proper study of such tumors. Most of the knowledge of the histopathology concerning this group of neoplasms has been acquired as a result of the use of these staining methods and they should be used more frequently in order that the cell types present may be more thoroughly studied.

The term glioma retinae is a good one, especially if used in a generic sense and is preferred by Ewing. Dr. Elz favors the splitting of the main group of gliomas into three subgroups, depending on the predominating type of cell present; namely, the medullo-epithelioma, the retinoblastoma, and the neuro-epithelioma. He does not agree with those authors who seem to imply that all these tumors should be called retinoblastomas.

On opening the eye under discussion the vitreous cavity was almost entirely filled with a white, granular, friable mass. Sections of this tumor showed it to be a typical glioma of the neuro-epithelioma subgroup. The great number

of mitotic figures present was striking.

This case is of particular interest because the remaining eye is also involved and is receiving X-ray treatment. Reports in the literature indicate that this method of treatment has met with some success even though the glioma is considered radioresistant. In an article published in the November, 1936, issue of the Archives of Ophthalmology, Martin and Reese describe an X-ray therapy technique which seems to be a distinct advance in the handling of cases such as this one.

H. Rommel Hildreth,
Editor.

CHICAGO OPHTHALMOLOGICAL SOCIETY

April 18, 1938

DR. THOMAS D. ALLEN, *president*

RELATION OF GLUTATHIONE TO GALACTOSE CATARACT

DR. JOHN BELLOWES and DR. L. ROSNER (by invitation) said that in a series of experiments galactose caused a decrease in the permeability of the capsules of beef lenses toward glutathione. Studies upon variation of lens glutathione with age were made. It was determined that lens glutathione of rats at birth is at the low value of about 50 mg. per 100 gm., it rises rapidly during the first days of life, reaches a peak of about 300 mg. per 100 gm., at an age of four months, then slowly declines. The glutathione concentration in the lens nucleus remains at a fairly constant low level, while that in the cortex fluctuates significantly with age. Feeding rats a diet high in galactose causes a loss of lens glutathione. However, when the animal is returned to a normal diet, the glutathione returns, showing ability of the lens to recover from incipient cataract. Even after development of cataract

the lens retains the ability to form normal transparent lens fibers in its periphery. Glutathione, however, cannot return to the opaque portion of the lens.

Discussion. Dr. L. Rosner (closing) said that upon feeding galactose the glutathione content in the lens decreased, and when the rats were returned to a normal diet the glutathione once more rose, indicating that the ability of the lens to produce this substance was retained.

He pointed out that it was difficult to study the capsule in life from the viewpoint of permeability. Two membranes are concerned, that of the capsule and the membrane of the lens fibers themselves. Thus a study in life of the lens capsule is complicated by the permeability of the lens fibers. If it were determined that a certain substance could not penetrate into the lens, would it be attributable to lack of permeability of the lens capsule or to impermeability of the membrane of the lens fibers? The experiments wherein the capsule was removed entirely, while open to the objection that they were not so significant as *in vivo* experiments, did get around the objection of possibly working with two different permeabilities.

In reply to Dr. Goldenburg's question, Dr. Rosner stated that there is no glutathione in the aqueous; it is contained entirely in the lens. The membranes of the body seem to have a selectivity to glutathione. In the blood, for example, it is in the red cells entirely; there is none in the plasma. It appears to be contained entirely in the cells of the body, not in the fluids. For that reason he believes that glutathione is probably manufactured in the lens itself and is not a matter of penetration into the lens.

CONGENITAL ABDUCENS PARALYSIS

DR. CARL APPLE read a paper on this subject which was published in this Journal (Feb., 1939).

Discussion. Dr. Sanford Gifford

thought that Dr. Apple had presented a very fine paper on this subject, to which too little attention was sometimes paid. It must be remembered, however, that there are a good many cases of congenital abducens paralysis in which the retraction syndrome is not a prominent feature. Some retraction might be found in all by careful study, but many cases had been seen in which it was not noticeable.

Tendon transplant had been successful in his hands. In cases without retraction, if strabismus was present, a good result could be obtained by transplant with tenotomy of the internal rectus. He had operated in nine cases. Two were acquired due to intracranial injury and the others were congenital, without a typical retraction syndrome. The outer half of the superior and inferior rectus was transplanted under the insertion of the external rectus, accompanied by tenotomy of the internal rectus. Possibly there were some bands in these cases, but that had not been investigated. In one case an over-correction was obtained, resulting in slight abduction. Only cases in which there was a primary convergence were brought to operation. The abduction which resulted from operation varied from 5 degrees to as much as 35 degrees. The only way such a result could be explained was not by the reëducation of the muscles but by the tone which these living-muscle slips gave to abduction. They held the eye in a certain position opposed by the internal rectus. When the internal rectus was relaxed in the attempt to abduct, they came into effect and actually caused the eye to rotate outward.

Cases of congenital abducens paralysis have been reported in which autopsy disclosed complete aplasia of the sixth-nerve nucleus; so it must be assumed that in such cases there is a central origin for the paralysis.

Dr. E. V. L. Brown asked if it would

be helpful to observe whether passive motion outward was possible under general anesthesia.

Dr. S. J. Meyer agreed with Dr. Gifford that operative interference is indicated and should at least be given a fair trial. He had operated on 18 patients with a good result in more than 50 percent. Some of the poor results occurred in cases in which there was marked secondary contraction of the internus muscle; so marked, in fact, that there was difficulty in performing a complete tenotomy of the muscle. He did not believe it made much difference whether lateral or medial halves of the superior and inferior recti muscles were transplanted. The external rectus muscle could be let alone if it were thought advisable. One must be meticulous in the dissection of the vertical muscles to be transplanted so that the sutures would not tear out.

Dr. Hallard Beard thought it always seemed fallacious to expect a portion of the adductor muscle to do the work of the abductor, such as one expected of the split portion of the superior and inferior rectus. One might hope to accomplish a good cosmetic position for the eyeball by such procedure, but hardly any restoration of function; and if one depended on the slight rotation of the eyeball by transplant of the tendon, then it would be better to sever the tendon of the externus if it were found to be a fibrous band. It would not be out of order either to slip back the insertion or sever the connection entirely from the eyeball so that it would not become reattached.

Dr. Carl Apple (closing) thought that Dr. Brown's suggestion was excellent. In 1926 Dr. Harold Gifford had stated that passive abduction should be tried in all cases. Passive abduction was attempted in the three cases reported, both prior to the operation and after tenotomy of the internus.

MONOCULAR PROTECTION VERSUS MONOCULAR OCCLUSION

DR. W. W. HOWARD read a paper on this subject which was published in this Journal (Feb., 1939).

Robert von der Heydt.

COLLEGE OF PHYSICIANS OF
PHILADELPHIA

SECTION ON OPHTHALMOLOGY

April 21, 1938

DR. ALEXANDER G. FEWELL, *chairman*

MUSCLE SPASM CAUSED BY EYEGLASSES

DR. LEO F. MCANDREWS presented the case of a man 41 years of age showing this interesting finding: as soon as the patient attempts to wear his glasses, a distinct, hard mass appears over the region of each mastoid. Under palpation this mass is evidently a contraction of the occipito-frontalis muscle. If the patient persists in wearing the glasses, the entire right side of the head and the right ear become painful and the neck becomes stiff. Removal of the glasses or firm pressure on the bridge of the nose causes the mass and discomfort to disappear. The condition has been present for about four years. The patient had a thyroidectomy three months ago, but he is still very nervous and emotionally unstable. There is no anatomic explanation for this condition. The probable explanation is that it is a neurotic manifestation associated with the toxic thyroid, and can be cured by appropriate psychotherapy.

Discussion. Dr. Walter I. Lillie said it was his impression that this is a spastic condition. Its duration of four years makes it very suggestive of a postencephalitic syndrome. When the man puts his glasses on he has a marked twitching of the eyelids. In a postencephalitic syndrome, especially those including respira-

tory changes, any sudden touch to any part of the body eliminates the attack. It would be interesting to follow this case and see if he develops a Parkinsonian syndrome.

OCULAR-MUSCLE PALSIES IN A CASE OF
TOXIC GOITER

DR. C. E. G. SHANNON made a supplementary report on a case of ocular-muscle palsies complicating toxic goiter. A preliminary report of this case was made at the meeting of the Section in April, 1937.

The patient, H. D., a milk driver, aged 47 years, was admitted to the Jefferson Hospital on April 2, 1936, with a diagnosis of exophthalmic goiter. His chief complaints were tremor of both hands, palpitation of the heart, bulging of both eyes, diplopia, excessive perspiration, and loss of weight. The blood count as also the Wassermann and Kahn reactions were negative. The basal metabolic rate was plus 45. Motility of the larynx was normal, with no apparent narrowing of the tracheal airway.

A subtotal thyroidectomy was performed, and the patient was discharged 10 days after the operation in good condition and relieved of all toxic thyroid symptoms aside from the proptosis and diplopia.

Briefly, the ocular history of the patient is as follows: In March, 1938, about a month prior to the removal of the thyroid gland, the patient first developed ocular symptoms consisting of diplopia, followed shortly by swollen and edematous lids and later by bulging of both eyeballs. The diplopia and proptosis persisted, but the lids became more quiet immediately following the operation. At the first examination of the patient, on December 4, 1936, the following notes were made: Vision, right eye 6/9 plus; left eye 6/9 mostly. Pupils were equal and reacted freely to light and consensually. The ten-

sion was normal in each eye; the media and fundi were negative. Both eyes were proptosed, the exophthalmometer showing 23 mm. on each side. The left eye appeared definitely deviated inwards and on a lower plane than that of its fellow. The Maddox rod showed an esophoria of 30 degrees and left hypophoria of 26 degrees. Diplopia was obtained in all the cardinal directions except in the immediate lower field—that is, about 12 to 14 inches from the eyes—indicating involvement of all the extrinsic muscles of the eyeballs. It was interesting to note that a wide separation of images at 20 feet diminished steadily as the light was brought toward the eyes until at a comparatively near point the diplopia nearly disappeared, suggesting a paresis of divergence. The power of accommodation was affected. The patient read J.14 at four inches on the right side and at five inches on the left side.

Various theories have been advanced in connection with the development of the exophthalmos, but so far none has proved entirely satisfactory. The etiology of muscle palsies in toxic goiter is still under discussion. The essayist made reference to the various theories so far presented by various authorities. In the preliminary report, an immediate operation to correct the muscular deviation was considered. In the discussion that followed, Dr. Zentmayer had suggested very wisely that an operative procedure should be delayed until the congestion and the proptosis had further subsided. He cited the report by Naffziger of cases of malignant exophthalmos with blindness in which enucleation was followed by death.

Two months later, under ether anesthesia, the superior rectus was tucked and the inferior rectus recessed. In addition, the external rectus was tucked and the internal rectus recessed. There was considerable reaction, as might be expected,

to these procedures but under ice compresses the swelling diminished, and binocular single vision was exhibited and still obtains.

A CATARACT SECTION REDUCING THE INCIDENCE OF IRIS PROLAPSE

DR. FRANK C. PARKER said the cataract operation today is frequently being made more and more complicated by conjunctival flaps and sutures. Instead of striving for simplicity and a short operative time, the opposite seems to be in vogue. In his own work he has found no reason whatever to make use of these embellishments.

Frequency of prolapsed iris in the simple extraction occurring up and in at about the 11-o'clock position in the right eye and at the 1-o'clock position in the left eye, raised the question as to the cause. The answer seemed to be that the drag of the knife as it is pushed through and pulled back with the upward push required to make the cut, is partly responsible. The structures—cornea and iris—are stretched peripherally, thereby weakening the iris fibers with resulting prolapse.

The incidence of prolapse has been greatly lessened by making the incision in a reverse manner to the customary section. As the knife is making the counter-puncture the heel is raised and the cut is made by pushing towards the pupillary center; and, as the knife is withdrawn, the point-end is raised, cutting as the blade is pulled back. In this way the force of the cutting results in a compression of the cornea and iris instead of peripheral stretching.

The manner of fixation is important in reducing the corneal stretching. The fixation forceps grasp the conjunctiva with a deep bite about 5 mm. above the upper limbus. The tissues between the cutting edge of the knife and the forceps above

the upper limbus are compressed, whereas when fixation is made below the whole cornea is stretched in the vertical meridian. If the cornea is stretched, it is reasonable to assume that the iris base is stretched as well. Large, bloody conjunctival flaps are not favored, simply a small fringe of conjunctiva on the lip of the wound is desired.

Discussion. Dr. H. Maxwell Langdon said he wondered if Dr. Parker has considered a bridle suture under the superior rectus. It seemed to him that it would not be quite so much in the way as forceps in this position, and it would give him very good counter pressure against the knife. He did not see just where reversing the usual procedure in making the cut exerts less drag on the cornea. If the point or the heel is raised first, the other portion of the knife must make the next step in the procedure and it seems to him that the drag would be about the same.

Dr. Francis Heed Adler asked Dr. Parker if he had noticed any decrease in the amount of striate keratitis in his cases, using the present method of making the section. He cannot understand how this method would diminish the incidence of prolapse of the iris, but he can believe that it might materially reduce the amount of striate keratitis.

Dr. Parker in answer to Dr. Langdon's question said he had never used the bridle-suture fixation, as it requires a pull upon the globe before fixation comes into play. With an open wound, such as is present following extraction, this does not appeal to him. Again, forceps fixation does away with any "swaying" of the eyeball. Further the placing of this suture adds to the operation and consumes time.

He had not seen any striate keratitis for some time past. Whether or not this can be attributed to the lessened "drag" in this incision he was not prepared to say. However, one might easily deduct that

with diminished stretching of the cornea, striate keratitis would be kept at a minimum.

THE CLINICAL SIGNIFICANCE OF THE RETINAL CHANGES IN LEUKEMIA

DR. GLEN G. GIBSON said his paper was a report of the laboratory and retinal findings of 22 cases diagnosed as various kinds of leukemia by the medical department of Temple University Medical School. Based on the findings in these cases a discussion of the diagnosis and the prognosis is given. Emphasis is placed on the retinal veins being darker and fuller than normal in 17 of the 22 cases. In general, there seemed to be a relationship between the amount of retinal hemorrhages and the clinical condition of the patient. In general, the patients who had the lowest red-blood-cell count had only a moderate degree of retinal hemorrhage and those with the higher red-blood-cell count had no retinal hemorrhages. It was suggested that it might be more advantageous to direct therapeutic and investigative procedures toward the factor of anemia instead of towards the leucocytosis.

Discussion. Dr. Gibson in answer to Dr. Adler said in observing these cases one gets the impression that the white centers are due to a collection of serum and hemorrhagic debris rather than to a nest of white blood cells surrounded by red blood cells. He regretted that he had no microscopic confirmation of this impression.

EXTERNAL ORBITOTOMY

DR. EDMUND B. SPAETH presented a moving-picture demonstration of the external-route orbitotomy without bone resection for the removal of retrobulbar tumor.

Warren S. Recse.
Clerk.

AMERICAN JOURNAL OF OPHTHALMOLOGY

Published Monthly by the Ophthalmic Publishing Company

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DICTATORSHIPS, DEMOCRACIES, AND POSTGRADUATE MEDICAL STUDY

The Greek word "turannos" (tyrant) meant an absolute ruler, and not necessarily one who abused his power. There have been a few benevolent despots, but there are not many exceptions to the rule that when the power of an individual or of a group is uncontrolled it will sooner or later be abused; that is, it will be exercised without regard to the rights of others.

It is probable that great political power has never been entirely free from abuse. No individual or group possesses infinite wisdom and fairness. The hysterical vagaries of the ignorant mob are notorious,

yet the rights and liberties of the general populace are in the long run safer under democratic than under autocratic, or "tyrannical," forms of government.

Today it appears that the greatest loss resulting from the World War is the sacrifice, in several civilized countries, of those great measures of human liberty which had been achieved step by step in the course of generations.

Exhausted by four years of murderous and ruinous struggle, and by the ensuing financial chaos, the democracies seem to have lost the spirit of resistance to usurpation and absolutism. Excesses such as disgraced the Middle Ages have been tolerated almost without a murmur by peoples who were regarded as in the van-

guard of civilization. Beneath the veneer of material progress man the brute appears in all his primeval crudity.

It is hardly surprising that a tyrant should make his own interpretation of scientific facts and values. His dogmas come first, and facts are grouped or distorted to suit those dogmas. Facts that fail to harmonize with his alleged principles must be ignored or falsified.

In the wonderful hygienic exposition of a large European city, the scientifically-minded traveler is shocked but not altogether surprised to find that the pure science of one section of the great building has been replaced by blatant, hideous, and unscrupulous exhibits whose purpose is to prove the purity and superiority of the Nordic and the degradation and inferiority of those who are denied that appellation.

Since absolute rulers do sometimes display liberality of thought, it would be wrong to argue that tyranny is always incompatible with scientific progress. But suppression of all independence of thought and action cannot fail to inhibit the scientific spirit.

Apart from more material considerations, one priceless advantage of living in a democratic community is the feeling that one may express himself according to his honest convictions and may hear or read a free expression of the opinions of others, without restraint of censorship or danger of political persecution. In some European countries, not even the traveler from another land may enjoy these privileges; and the visiting tourist suffers from an uneasy sense of restraint and concealment. No amount of hospitality displayed by those among whom he travels can overcome these barriers. Newspapers report only what they are allowed to report. Newspapers and citizens alike believe (to outward appearance) only what they are allowed to believe. After such an experi-

ence, to cross the boundary into a country that is still democratic is to escape from a mental and spiritual prison.

In spite of the rapid development in facilities for postgraduate education in the United States and Canada, many medical pilgrims from this country still visit the old clinical institutions of central Europe. But under present conditions it may be doubted whether such cities as Vienna will maintain their former prestige as centers for postgraduate study in the various fields of medicine.

We are told that in the stress of preparation for another great war, one of the dictator countries has recently curtailed the undergraduate period of medical study, as well as cutting one year from the length of the "gymnasium" or preprofessional course. A certain significance may also be attached to changes in the field of medical journalism, due perhaps partly to political and partly to economic causes.

The combination of Graefe's *Archiv für Ophthalmologie* with *Archiv für Augenheilkunde*, both journals of very limited circulation, may probably be dismissed as a mere matter of economy. Removals of journals from one country to another are more likely political in character. What was formerly the *Zeitschrift für Augenheilkunde*, an excellent monthly founded forty years ago by Kuhnt and Michel, is now published as "*Ophthalmologica*" at the Swiss city of Basel. It prints essays in English, French, and German, and its list of editors contains prominent names from various civilized countries, not including Germany.

Another medical periodical, *Ars Medici*, has moved its place of publication to Basel from Vienna. In that great Austrian capital it served for sixteen years as a sort of publicity agent for postgraduate medical teaching facilities. It is a modest monthly, "the only medical journal in the English language appearing on the Continent,"

and presenting usually one original article and a large number of well-written abstracts from miscellaneous medical journals. It had formerly an official connection with the "American Medical Association of Vienna," an organization having no connection with the American Medical Association, but serving as a center for contact and information among English-speaking physicians who were attending the Viennese schools, hospitals, clinics, and privately conducted classes.

This little journal announces that one of its major purposes is to furnish information to physicians seeking postgraduate work. "Five faculties of as many medical colleges of the universities Basle, Berne, Geneva, Lausanne, and Zurich . . . are now prepared to teach you if you desire to specialize or do postgraduate work in any and all branches of medicine." It is added that all courses will be in English. The name of Professor Alfred Gigon, Klosterberg 27, Basel, Switzerland, is given as chairman on the faculty committee, to whom correspondence relating to medical courses in Switzerland may be addressed.

The five Swiss universities mentioned have produced many famous names in medicine. Switzerland is the world's greatest holiday resort. It is still one of the freest countries of the world. Foreign study is usually combined with a good deal of sight-seeing and enjoyment of other recreational facilities. Think of the opportunity for such combinations afforded by Basel, south of which lies a rolling country at least as attractive as the Black Forest although less advertised; Bern, the Swiss capital, a little way north of the Bernese Oberland; Geneva, astride the west end of Lake Geneva and within easy distance of Mont Blanc; Lausanne, further along Lake Geneva; and Zurich, commercial capital of Switzerland, location of this year's Swiss national exposi-

tion, and scene of Vogt's work on the slit-lamp. If you desire to go abroad for postgraduate study, why not choose Switzerland?

W. H. Crisp.

TREATMENT OF GLAUCOMA

When ophthalmic surgeons first recognized glaucoma as a cause of terrible pain and permanent blindness, these effects seemed unavoidable. When Graefe noticed that iridectomy lowered intraocular tension, and reported some cases cured by the operation, it was at once accepted as the one cure of glaucoma. Since then, other operations—division of the ciliary body, iridotomy, trephining, iris inclusions, the Lagrange operation, cyclodialysis, Holth's punch operation, and opening of Schlemm's canal—have been brought forward as curative of the disease. These operations have all been founded, mainly, on the assumption that glaucoma was caused by mechanical obstruction to the outflow of fluid from the eyeball, and was to be relieved by opening a new channel for such mechanical outflow.

We cannot believe that the regulation of intraocular tension is purely a mechanical process. The regulation of intraocular tension must be intimately connected with the nutrition and metabolism of ocular tissues. But our knowledge of the physiology and biochemistry of nutrition for the different tissues of the eye is scanty. It must be supposed that the endothelium of the capillary blood vessels and the glass membranes of the eye—Bowman's, Descemet's, the lens capsule, and Bruch's—may play a part in these processes as well as the composition of the blood serum and the height of the blood pressure.

An approach to this side of the glaucoma question is suggested in the use of splenic extract, as described in this issue of the Journal, page 536. The facts al-

ready observed would suggest the production in the spleen of some biochemical product capable, either directly or indirectly, of influencing the intraocular pressure. What this substance is, and how it acts, we do not know. But each use of it to reduce the intraocular pressure in a case of glaucoma becomes a physiological experiment, to be observed and recorded, with associated phenomena, as capable of throwing possible light on the essential process of intraocular tension and its pathological increase.

The operations that have been done for glaucoma, and each urged as superior to the others, are so varied in their plans and execution, and are supported by such a wide range of theoretic explanation of glaucoma and its relief, that we must realize the treatment of glaucoma is quite empirical; and anything that as an empirical treatment seems to give relief must be considered worth trying. It would justify careful observation, with the presumption that it has some value. Under these circumstances, even if we doubt the theoretical explanations of such cures, we have the right and duty to make use of the new remedy in those cases where there is a doubt of the efficacy of the remedies we have previously relied on.

The miotics have been widely tried for glaucoma, and generally with benefit. Laquer, of Strasburg, for more than five years kept his own eyes from any permanent loss of vision by increased tension, before he had them operated on (iridectomy) by Horner. After that he lived a quarter of a century using his eyes, as he had done before, without any recurrence of glaucoma. In occasional cases of undoubted glaucoma, the use of miotics has brought about a return of the eye to health, with no recurrence of the disease subsequently. The common belief that glaucoma means either operation or blindness is not correct. We must admit that

there is something beside operation that can cure glaucoma. To find out what this something is, is a proper subject for investigation and experiment. What we now know of the actions and power of the endocrines makes it reasonable to think that something formed in the spleen may be what is needed to reduce intraocular tension. Only experiment can decide whether this is, or is not, true.

It is not true that a certain increase of intraocular tension is safe for all eyes; or that pressure above a certain point is sure to damage a particular eye. Eyes with less than 20 mm. of mercury pressure undergo atrophy of the optic nerve, with deep, glaucomatous cupping. Other eyes with tension of over 30 mm. go on for years without any impairment of vision or of the visual field. We do not recognize brief changes of intraocular tension without evidence of damage to visual function. We need more knowledge of the physiology of ocular nutrition and of intraocular pressure to furnish a rational basis for the therapeutics of glaucoma. Meanwhile, every measure found empirically to be of some benefit should be tried. It should be studied to find its relative efficiency and indications and to enrich our armamentarium for the future.

Edward Jackson.

BOOK NOTICES

TRANSACTIONS OF THE AMERICAN OPHTHALMOLOGICAL SOCIETY. Edited by Dr. Bernard Samuels. Clothbound, 370 pages, Philadelphia, Wm. F. Fell Co., 1938, volume xxxvi.

The seventy-fourth annual meeting of the American Ophthalmological Society was held in San Francisco. Dr. Frederick Tooke of Montreal was elected president, succeeding Dr. F. H. Verhoeff. There are

25 excellent papers in this volume: 11 deal with clinical and experimental pathology, 3 are on surgical procedures, and 2 on aniseikonia.

Dr. Wm. H. Crisp advises the use of cycloplegics in refraction and the full correction of the reportive error. The discussion of this paper by Drs. Jackson, Gradle, and Lancaster reveals rather marked differences of opinion on the subject of refraction. Dr. Joseph L. McCool reviews the literature on tumors of the lacrimal sac and records a case of mixed tumor of the sac. Dr. Bernard Samuels, from a review of many proved cases of sympathetic ophthalmia, found that in 3 percent there had been a preceding panophthalmitis. The extreme importance of the correct microscopical diagnosis of sympathetic ophthalmia is emphasized.

Dr. Charles Tooker reports a case of metastatic septic endophthalmitis with ring abscess of the cornea. Dr. Arnold Knapp presents a case of orbital hyperostosis in meningioma. The ocular manifestations of brucellosis (Malta or undulant fever) and the history of the disease are reviewed by Dr. John Green. The incidence of the disease is high; the ocular symptoms and pathology resemble tuberculosis. The diagnosis of brucellosis is made by skin tests and blood agglutination tests. Dr. Derrick Vail records the syndromes of opticochiasmatic arachnoiditis with optic-nerve atrophy and blindness. The study indicates that neuro-surgery in early cases may be of value in preserving vision. Dr. Albert N. Lemoine reports an optic-tract lesion associated with infection of the sphenoidal sinuses. Dr. John Wheeler describes a new technique for correction of spastic entropion by transplanting the orbicularis muscle. Dr. Paul Chandler recommends inferior iridotomy in cataract extraction on eyes affected by iritis, cyclitis, or glaucoma.

The history of American ophthalmology from 1908-1915 is given by Dr. S. Judd Beach. Dr. Arthur Bedell records three cases of traumatic retinal angiopathy. Clear photographs of the fundi are shown. Dr. Phillips Thygeson describes the Carrel technique of tissue culture and reports the cultivation of human conjunctival and corneal epithelium. Dr. Trygve Gunderesen records the results of auto-transplantation of cornea into the anterior chamber. The endothelium thrives; the stroma survives and the epithelium disappears. Dr. Parker Heath and Dr. C. W. Geiter report physiologic and pharmacologic reactions of iris muscle by an autographic method. There are two papers on aniseikonia, one by Dr. Lancaster on its causes and consequences, and one by Dr. Conrad Berens, who reports that of 836 patients examined for aniseikonia 438 were given iseikonic lenses, and of these 73 percent were improved.

Dr. Gordon M. Bruce records an unusual type of retinitis found in three cases of dermatomyositis. The lesions were confined to the posterior pole of the eye and consisted of scattered grayish-yellow areas of exudates resembling cotton-wool patches. Dr. Arlington C. Krause reports on the proteins, lipids, and water-soluble extractives in fresh bovine optic nerves. Dr. P. J. Leinfelder presents the pathological findings in retrograde ganglion-cell and nerve-fiber degeneration following section of the nerve anterior to the chiasm. Dr. William Stokes, from a study of experimental keratitis, concludes that corneal corpuscles may undergo transitional forms, may act as phagocytes, and are a source of macrophage formation.

The papers reveal the continued interest in clinical pathology and the growing significance of experimental work in American ophthalmology.

Wm. M. James.

PSYCHOLOGICAL OPTICS. By Vernon W. Grant, M.A. With an introduction by Thomas G. Atkinson, M.D. Clothbound: 230 pages, bibliography, index. Published by The Professional Press, Inc., Chicago, Ill., 1938.

"Psychological optics is defined as the study of the mental side of vision." "What we see, depends largely on what we are looking for." "Visual responses are designed to adapt the organism to its environment, which means to serve its wants and preserve it from injury." "Vision, therefore, consists of conscious impressions and muscular adjustments, either voluntary or reflex." These are a few of the leading statements in this book and give a general idea of its content. The chapter headings indicate the wealth of detail covered; for example, fundamentals of behavior, as seen in general psychology and applied to vision; a discussion of the visual reaction system; visual per-

ception; visual perception of space; attention in relation to vision; visual sensations and illusions.

One of the most interesting discussions is that of suppressed vision, which can be interpreted in terms of the psychology of habit formation. Edward Jackson more than hinted at the importance of visual psychology in discussing the problem of aniseikonia.

The book forms a liaison between physiological optics and visual impressions, and should be of concern to all ophthalmologists, particularly those interested in orthoptics, muscle anomalies, and reading difficulties.

It is well illustrated with line drawings accurately explained. However, in the reviewer's opinion, a bad psychologic impression is obtained as a result of the poorly printed small type used throughout.

Derrick Vail.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, and history
19. Anatomy, embryology, and comparative ophthalmology

5

CONJUNCTIVA

Ruata, V. Rickettsiosis and trachoma. *Rassegna Ital. d'Ottal.*, 1938, v. 7, Sept.-Oct., pp. 621-648.

The author presents a valuable critical review of our knowledge to date of the etiology of trachoma. He offers the following conclusions: An aqueous emulsion of trachomatous tissue contains a virus capable of reproducing true trachoma in the human conjunctiva. These filtrates often contain granular elements which greatly resemble Prowazek-Halberstaedter bodies and also rickettsia bodies. The inoculation of trachomatous material or the filtrate into the vitreous of rabbits produces a local nodular reaction, devoid of specific character. Inoculation of this material into other structures (testicles, glands) produces a nonspecific inflammatory reaction which cannot be proved due to the trachoma virus. Attempts to prove the existence of rickettsia bodies in trachoma by inoculation of the louse have not given a definite answer, nor have the attempts to cultivate the tra-

choma virus and the rickettsioid bodies by Carrel's method.

Eugene M. Blake.

Shlikova, B. D. The use of perilla oil in the treatment of trachoma. *Viestnik Ophth.*, 1938, v. 13, pt. 5, p. 677.

An analysis of the results of 100 cases, treated with the oil derived from the seeds of *Perilla Acymoides Labiatae*. It is used in topical applications and as drops instead of chaulmoogra oil, which in Russia has to be imported. The result was excellent in 17 percent of the cases, good in 36 percent, and satisfactory in 47 percent. The best results are obtained in early trachoma, with improvement setting in rapidly, and the final scars being thin.

Ray K. Daily.

Tikhonovich, I. F. A case of bilateral tuberculous conjunctivitis palpebral and scleral. *Viestnik Ophth.*, 1938, v. 13, pt. 5, p. 695.

The diagnosis was made by inoculation into a guinea pig, and the case recovered under a nourishing diet, cod-liver oil, ultraviolet irradiation, mer-

cury injections, and silver-nitrate and iodoform salve locally.

Ray K. Daily.

Wilson, R. P. Heterotopic bone in conjunctiva. Giza Mem. Opth. Lab., 1937, 12th ann. rept., p. 50.

A male aged twelve years came to the hospital on account of a small lump under the lid in the region of the outer canthus, gradually increasing to the size of a pea. Just below the palpebral conjunctiva was found a large island of normal compact bone, and also trachoma scar and pathology.

Lawrence G. Dunlap.

Yousefova, F. I., and Bogdanovitch, S. N. Lupus erythematosus of the conjunctiva. Ann. d'Ocul., 1939, v. 176, Jan., pp. 27-32.

A 23-year-old patient with fibroid pulmonary tuberculosis and typical lupus erythematosus of the face also had conjunctival involvement. This consisted of small gray-white granular papules with slightly depressed centers. Biopsy showed invasion of lymphocytes, monocytes, eosinophiles, epithelioid cells, and Langhans giant cells. Tuberculin treatment was abandoned because of marked focal reactions. Some improvement was obtained with mercurials.

John M. McLean.

6

CORNEA AND SCLERA

Awerbach, M. I. A case of corneal transplantation. Viestnik Opht., 1938, v. 13, pt. 5, p. 690.

The author reports corneal transplantation in a case of corneal burn with preoperative vision 0.01 percent. The final visual result, thirteen months after operation, was normal visual acuity.

Ray K. Daily.

Castroviejo, Ramon. Corneal implant. Rev. Oto-Neuro-Oft., 1938, v. 13, Sept., p. 205.

This is a Spanish adaptation of a collective review which appeared in Surgery, Gynecology, and Obstetrics, 1937, v. 65, p. 589. Edward P. Burch.

Edison, S. M. Interstitial keratitis treated with zinc ionization. Illinois Med. Jour., 1938, v. 73, May, p. 405.

The author states that zinc ionization seems to be of benefit in promoting absorption of infiltrates and scars in interstitial keratitis, especially if his method and electrodes are used.

Theodore M. Shapira.

Golubeva, K. Metastatic ocular involvement in influenza pneumonia. Viestnik Opht., 1938, v. 13, pt. 4, p. 543.

In twenty years at the ophthalmic hospital in Tul there were four cases of metastatic episcleral abscess complicating respiratory infections. In three the causative agent was the staphylococcus and in one the pneumococcus of Frankel. In the latter case there were at the same time iritis and neuritis; also the inflammatory symptoms were less acute, the course less stormy, and the final result better than in the cases caused by the staphylococcus.

Ray K. Daily.

Katznelson, A. B. Epibulbar tuberculosis. Viestnik Opht., 1938, v. 13, pt. 4, p. 507.

A review of the literature and a report of three cases of tuberculous keratoconjunctivitis, with the diagnosis verified by animal inoculation. One case presented a large solitary granuloma at the limbus, the second a localized process involving the cornea and adjacent conjunctiva, and the third a diffuse infiltrative process of the cornea and con-

junctiva. The clinical findings and the pathologic pictures of tissues excised for biopsy refute the contention of Junius that true epibulbar tuberculosis occurs only in the form of small nodules, with slow and insignificant necrosis and with a scanty content of bacilli. The authors' conclusion is that epibulbar tuberculosis takes various and transitional forms. It develops as a result of subconjunctival infection and spreads superficially and deeply. Epibulbar tuberculoma is usually associated with severe generalized tuberculosis and is the result of a hematogenous infection. Its prognosis is serious for the eyeball and for life. Its therapy should consist of constitutional stimulation and of the various forms of irradiation. (Photomicrographs.)

Ray K. Daily.

Knapp, A. A. Results of vitamin-D-complex treatment of keratoconus. *Amer. Jour. Ophth.*, 1939, v. 22, March, pp. 289-292.

Kostenko, F. M. Treatment of trachomatous pannus with cadaver mucous membrane, preserved on ice. *Viestnik Ophth.*, 1938, v. 13, pt. 4, p. 500.

For Denig's transplantation Kostenko uses mucous membrane excised from lips of cadavers and preserved on ice from one to six days. In nine cases he found the material suitable, taking readily, and having a favorable effect on old cases of trachoma. It was gradually absorbed and left no cosmetic blemish. The author recommends suturing the transplant to the tendons of the four recti muscles.

Ray K. Daily.

Krachmalnikov, L. K. The etiology of filamentous keratitis. *Viestnik Ophth.*, 1938, v. 13, pt. 4, p. 558.

A report of a case which the author attributes to ovarian hypofunction.

Ray K. Daily.

Medvedev, H. I. Partial keratoplasty. *Viestnik Ophth.*, 1938, v. 13, pt. 6, p. 733.

An analysis of 24 cases. The results are not good in eyes with leucoma, and the author considers the indications for this operation very limited.

Ray K. Daily.

Moretti, Egisto. Contribution to the surgery of trachomatous pannus. *Ann. d'Ocul.*, 1939, v. 176, Jan., pp. 41-52. (See *Amer. Jour. Ophth.*, 1939, v. 22, Feb., p. 221.)

Natanson, M. C. Requirements and indications for keratoplasty. *Viestnik Ophth.*, 1938, v. 13, pt. 4, p. 497.

In the author's opinion the main indication is a corneal leucoma with good projection and normal intraocular tension. Extensive vascularization, adhesion, and synechia make the prognosis unfavorable. The most favorable age is from fourteen to thirty years. Syphilis may cause disagreeable operative complications and should be treated pre-operatively. Patients with as much as 0.1 vision should not be subjected to transplantation.

Ray K. Daily.

Rintelen, F. Protection of the implant in optical keratoplasty. *Ophthalmologica*, 1938, v. 96, Dec., p. 155.

The author anchors the implant by means of two pairs of sutures at right angles to each other, placed in the conjunctiva and traversing the cornea. To protect the corneal tissue, a sheet of gutta percha is laid between it and the sutures. A window in the gutta percha permits observation of the cornea.

F. Herbert Haessler.

Sgrosso, Salvatore. Keratoplasty. *Rassegna Ital. d'Ottal.*, 1938, v. 7, Sept.-Oct., pp. 577-592.

The author reports two cases of keratoplasty, one of which was of the partial, non-perforating type, the other

done by transplanting the clear peripheral portion of the cornea to the center. So far as healing was concerned both cases were successful, but the transparency of the cornea was not maintained satisfactorily in either case.

Eugene M. Blake.

Talkovskii, S. I. Neurologic data on the corneal processes in herpes zoster ophthalmicus. *Viestnik Opht.*, 1938, v. 13, pt. 5, p. 636.

A review of the literature and a report of a case with central involvement of the cornea, involvement of the trigeminal and dysfunction of the sympathetic. On this basis the author concludes that herpes zoster ophthalmicus is a tissue reaction to various types of irritant. The seat of disease is usually a portion of the trigeminal. Involvement of the Gasserian ganglion is common but the process may begin in its peripheral branches or associated nerves. The trigeminal, which morphologically and physiologically resembles the posterior nuclei of the cerebrospinal nerves, determines the biologic processes in the ectodermal portion of the cornea, and is neurotropic to the ectodermal viruses. The development of the corneal process, and its form and localization, are determined by the morphology of the neural apparatus of the cornea and the state of the nervous elements anatomically connected with it.

Ray K. Daily.

Wilson, R. P. Bilateral multi-nodular episcleritis (tuberculides). *Giza Mem. Ophth. Lab.*, 12th ann. rept., 1937, pp. 87-88.

A man aged 36 years, was seen with an early bilateral ocular inflammation which progressed until multiple yellowish nodules appeared around the limbus in each eye, especially in the intermar-

ginal area. Although much elevated, these nodules did not ulcerate and were not tender. The corneae remained clear and recovery was complete after two months treatment with tuberculin. There was no recurrence.

Lawrence G. Dunlap.

Wilson, R. P. Leprotic keratitis. *Giza Mem. Ophth. Lab.*, 1937, 12th ann. rept., p. 57.

In the blind right eye of a female aged fifty years, a leper of the advanced nodular type, a fleshy granular tumor covered the cornea and sclera. The cornea of the left eye was nebulous and showed a similar fleshy pannus. Multiple nodules were scattered over the body, especially the face, arms, and hands. Ziehl-Nielsen-stained sections showed enormous numbers of *B. leprae* in all forms, both intracellular and extracellular. The iris and ciliary body also contained a few lepra bacilli. The choroid and retina were free from any sign of inflammatory reaction.

Lawrence G. Dunlap.

7

UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Babel, J. Eye manifestations in a patient with the meningotyphus of swineherds. *Ophthalmologica*, 1938, v. 96, Dec., p. 159.

This disease is not uncommon among the swineherds of Switzerland, France, and northern Italy. The patient in question had great lassitude and meningeal as well as abdominal symptoms in the course of a febrile disease. He had had ocular pain since the onset of fever, and on physical examination was found to have a bilateral fibrinous iritis. Cultures and animal inoculations failed to reveal a causative organism.

F. Herbert Haessler.

Bourdier, F., and Stein, M. Traumatic cyst of the iris. *Bull. Soc. d'Ophth. de Paris*, 1937, Dec., p. 731.

A cyst of the iris developed at the site of an anterior synechia of iris with corneal cicatrix, twenty years after perforating injury of the globe. Three c.c. of fluid was aspirated from the cyst, and it reformed in fifteen days. Treatment discussed includes excision of that portion of the iris, aspirating contents and injecting phenol, and partial ablation. Complete removal by iridectomy was impossible because the wall of the cyst was incarcerated in the cicatrix.

Harmon Brunner.

Burnier, Penido. Adie's syndrome. *Rev. de Oft. de São Paulo*, 1938, v. 6, Oct.-Nov.-Dec., pp. 187-194.

A woman of 48 years for three years had pain in the right eye radiating to the neck, and a typical pupillotomy of the same eye. The tendinous reflexes of the lower limbs were absent. Blood and cerebrospinal-fluid tests for syphilis were negative. The biomicroscope showed atrophy of the iris of the affected eye, including pigmentary border of the pupil. The author calls attention to the harm done by confusion of such cases with tabes. Adie's syndrome has nothing to do with syphilis.

W. H. Crisp.

Magitot and Morax. The curative action of retrobulbar injections of alcohol in some cases of gonococcal iritis. *Bull. Soc. d'Ophth. de Paris*, 1937, Oct., pp. 617-620.

Reported in 1936, this procedure was utilized to control pain in intractable cases, and clinical improvement was observed in some. It is suggested that in this type of iritis the symptoms are due less to the number of organisms in the tissues than to the intensity of the

neurovascular reaction. In the discussion, cases were reported of hemorrhagic glaucoma where relief of pain made enucleation unnecessary.

Harmon Brunner.

Michaud, Paul. Horner syndrome provoked by retrobulbar injection of acetylcholine. *Bull. Soc. d'Ophth. de Paris*, 1938, March, p. 138.

A patient of 46 years with thrombosis of the central vein of the retina was given a retrobulbar injection of 50 mg. of acetylcholine, and three days later ten mg. more. After three days more the vision was much improved; but there was a paralysis of the external rectus and superior rectus muscles, and a Horner's syndrome. The paralysis disappeared, but the typical Horner's syndrome persisted.

Harmon Brunner.

Reed, J. R., and Goldfain, E. Recurrent iritis in undulant fever with concurrent rheumatic and/or arthritic disease. *Jour. Oklahoma State Med. Assoc.*, 1938, v. 31, Sept., pp. 302-304.

Five cases of recurrent iritis with concurrent joint disease are reported. All five had a positive skin test and positive opsonic index for brucella, four of the five having also a positive agglutination test. Vaccine treatment produced a localized reaction in one case. The authors conclude that undulant fever was the probable cause in these cases, and that, in the absence of other cause, evidence of chronic brucellosis should be searched for in cases of iritis.

T. E. Sanders.

Reid, A. McKie. A case of congenital aniridia fitted with pigmented contact glasses. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 57, pt. 1, p. 434.

A patient with aniridia which had

greatly handicapped his business and social life was fitted with a contact glass with the corneal portion opaque except for a clear central pupil. The spherical correction was -4.00 at 10 mm. in front of the cornea and gave the patient 6/6 vision.

Beulah Cushman.

Sédan, Jean. Granuloma of the iris appearing before a pulmonary tuberculosis and permitting an earlier diagnosis. *Bull. Soc. d'Opht. de Paris*, 1937, Dec., p. 701.

A large, yellow, gummatous mass appeared on the pupillary border in a twelve-year-old girl. Attention is directed to the unusual site and to the formation so very similar to a gumma. Observations cover two years.

Harmon Brunner.

Teulières, M., and Beauvieux, J. Pearly cyst of the iris following trauma, with inclusion of an eyelash in the anterior chamber. *Bull. Soc. Franç. d'Opht.*, 1938, v. 51, pp. 400-405. (See *Amer. Jour. Ophth.*, 1939, v. 22, March, p. 350.)

Zabotinskaja, R. P. The effect of paracentesis of the anterior chamber on the course of tuberculous iritis. *Viestnik Opht.*, 1938, v. 13, pt. 4, p. 520.

This is the report of a laboratory study on rabbits, to verify Schieck's claims on injection of blood into the anterior chamber in tuberculous iritis. The report, based on a period of observation of six to eight months, shows that this procedure brings about a brief and transitory improvement, which is followed by exacerbation. In addition there is an unfavorable effect on the fellow eye, manifesting itself in the appearance of fresh tubercles.

Ray K. Daily.

8

GLAUCOMA AND OCULAR TENSION

Atchison, H. H. Case of progressive atrophy of the iris and absolute glaucoma. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 430.

A woman 35 years old, who was found to have absolute glaucoma, gave a history of an irregular pupil, first noticed twelve years previously, and which had gradually become larger and drawn nasally. Later posterior precipitates and a keratitis bullosa were found.

Beulah Cushman.

Clarke, S. T. Mecholyl and prostigmine in the treatment of glaucoma. *Amer. Jour. Ophth.*, 1939, v. 22, March, pp. 249-257.

Davies, W. S. Nevus flammeus and arrested hydrophthalmos. *Amer. Jour. Ophth.*, 1939, v. 22, March, p. 298.

Fradkin, M. I. Hemato-ophthalmic barrier in chronic vagotonus and sympathicotony. *Viestnik Opht.*, 1938, v. 13, pt. 5, p. 647.

This laboratory investigation on rabbits demonstrates that raised sympathicotonus leads to lowering of the barrier to crystalloids. The permeability remains unchanged in increased vagotonus.

Ray K. Daily.

Kantorovich, A. I. Sclero-iridectomy for glaucoma in the Dniepr Eye Hospital. *Viestnik Opht.*, 1938, v. 13, pt. 4, p. 485.

As to 79 operations, vision was improved in 67 percent of the eyes, and in 96.2 percent tension was normalized. From this experience and a review of the literature the author concludes that the procedure is as effective as any other antiglaucomatous operation.

Ray K. Daily.

Nectoux, René. The action of yohimbine on the visual fields of a glaucoma patient. *Bull. Soc. d'Opht. de Paris*, 1938, no. 2, Feb., p. 103.

The field of one eye was constricted to within 15 degrees of fixation. The other field had a nasal step. The patient refused operation. Two mg. yohimbine hydrochloride was given daily for five days. The constricted field became smaller, but the nasal step disappeared in the other eye. The intraocular tension was slightly lowered. The author concludes that yohimbine depends upon the integrity of the local circulatory system for its effectiveness.

Harmon Brunner.

Pletneva, H. A., Raeva, H. V., and Voronina, E. G. Biologic analysis of the aqueous in glaucoma. *Viestnik Opht.*, 1938, v. 13, pt. 4, p. 462.

A detailed report of a laboratory investigation which recorded the effect of the aqueous on a frog's heart. The material consisted of 55 glaucomatous eyes, 41 cataractous eyes, and 2 eyes with iridocyclitis. In 40 percent of the glaucomatous eyes the aqueous contained a sympathicotrophic substance, in 28.8 percent a vagotropic substance, and in 12.7 percent both.

Ray K. Daily.

Rozovskaja, S. B. The significance of elastotonometry in the diagnosis of glaucoma. *Viestnik Opht.*, 1938, v. 13, pt. 6, p. 749.

A review of the literature, a detailed report of the author's own investigation on the phenomena of elastotonometry, and a comparison of data obtained by this procedure with the data afforded by the daily tension curve. The conclusions are that the elastotonometric curves show morning and evening variations. In 62.6 percent of glaucoma

cases the evening curve was normal and the morning curve definitely pathologic. In 25.3 percent of glaucoma cases both the evening and morning curves were pathologic. In 12 percent of the cases the evening curves showed greater deviation from normal than the morning curves. In these cases the daily tension curve was of a reverse character. In normal eyes there was no difference between the morning and evening curves. This was true also in cases in which the intraocular tension was normalized by miotics or operation. Of 107 cases, in 103 there was agreement between the elastotonometric and daily tension curves, and only in 4 did the elastotonometric curves show greater deviation in the evening, while the intraocular tension was highest in the morning.

Ray K. Daily.

Schmelzer, H. On the general causes of the origin of primary glaucoma. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, Aug., p. 401.

In an effort to determine basic causes, studies of blood chemistry were made on 55 patients suffering from primary glaucoma and on 45 patients who were free from the disease.

The most significant alteration was a hypercholesterinemia which occurred in 51 of the 55 patients with glaucoma. The author feels that hepatic dysfunction may account for the abnormal cholesterol values in the blood serum, the liver cells having lost their capacity for storing cholesterol and their power of regulating its assimilation.

In addition to orthodox local measures against primary glaucoma, such as miotics, it is suggested that a diet rich in carbohydrates and low in fats and proteins, together with small doses of insulin, may be beneficial.

Edward P. Burch.

Zaverucha, F. M., and Tebenikhina, V. I. The effect of muscular fatigue on intraocular tension. *Viestnik Opht.*, 1938, v. 13, pt. 4, p. 489.

A report on a laboratory investigation relative to the effect of muscular fatigue on blood pressure, intraocular tension, and retinal blood pressure of normal athletes and glaucoma patients. In normal persons, the data obtained show no interrelation in these functions. The effect of muscular exercise on intraocular tension was inconstant. In 55 percent of the cases it was lowered, in 47 percent it was raised, and in 10.5 percent it remained unchanged. The effect of exercise on glaucoma patients was also variable, and no prediction as to its effect in an individual case is possible.

Ray K. Daily.

9

CRYSTALLINE LENS

Bonnet, P., and Paufigue, L., *Cataract: the value of total extraction*. *Bull. Soc. Franç. d'Opht.*, 1938, v. 51, pp. 439-445.

After a study of two hundred such cases, the authors consider that the operation of total extraction is contraindicated in nuclear, intumescent, and hypermature cataracts. In these cases they prefer the Daviel operation. After study of two thousand cases operated upon by the method of total extraction, the authors consider this the method of choice in most cases. Careful slitlamp study is necessary to determine the anatomic classification of the cataract. In senile uncomplicated cataract, total extraction is not followed by vitreous prolapse, detachment of choroid or retina, vitreous opacities, or secondary glaucoma to any greater extent than the Daviel method. Preliminary iridectomy is recommended in cases compli-

cated by synechiae or hypertony, and in some diabetics.

Clarence W. Rainey.

Dejean, C. Three safety measures for facilitating total extraction of cataract. *Bull. Soc. Franç. d'Opht.*, 1938, v. 51, pp. 436-438.

The danger of vitreous loss prevents the wide-spread use of the method. Certain operative procedures lessen this danger. One is akinesia of the superior-rectus muscle obtained by retrobulbar injection into the inferior face of the muscle, at the junction of the middle and posterior thirds. Hypotony is the rule and the operation is begun about the tenth minute after the injection. Tonometry is used systematically. Where the tension goes up after retrobulbar injection, the operation is deferred four or five days, and the tension is then lowered by another injection. The third procedure is use of a corneoscleral suture. The author also describes his special lens forceps.

Clarence W. Rainey.

Foster, J. Subepithelial disseminated traumatic cataract of Vogt. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 436.

Seven months after an intraocular fragment of steel was removed from the vitreous, there was a dense central cataract with small, discrete, intensely white, subcapsular spots distributed along the lines of the sutures.

Beulah Cushman.

Graves, Basil. Cataract and other operations during deep sleep induced by paraldehyde and omnopon. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 309.

The author feels that in the safety of paraldehyde narcosis (in which the eye

does not roll up) speed is not a factor and cataract extraction may be done deliberately and with great caution. He combines omnopon with the paraldehyde and several days previously he usually tests its effect as to the possibility of causing vomiting. He describes his technique of cataract extraction.

Beulah Cushman.

Lagrange, Henri. Forceps for intracapsular extraction. *Bull. Soc. d'Opht., de Paris*, 1938, no. 1, Jan., p. 22.

Presentation of capsule forceps with concave surface to approximate the curve of the anterior capsule and with a concavity in the jaws. (3 photographs.)

Harmon Brunner.

Lagrange, H., and Goulesque, J. Original technique for total extraction of cataract. *Bull. Soc. Franç. d'Opht.*, 1938, v. 51, pp. 432-435.

The essential points of the method are a gentle technique for avoiding injury to the zonula and ciliary body, a large corneal incision, and a conjunctival flap or bridge. The authors mention a special capsule forceps.

Clarence W. Rainey.

Porsaa, Kaj. Posterior lenticonus. *Oft. Selskab i Köbenhavn's Forhandlinger*, 1937-1938, pp. 5-7. In *Hospitals-tidende*, 1938, Dec. 13.

This condition was discovered incidentally in a man twenty years old. The right eye was strongly myopic and the vision was limited to hand movements at two feet. The pupillary reflex showed a central dark spot surrounded by a light or dark zone according to the position of the mirror. The slitlamp revealed a symmetrically rounded bulge of the posterior capsule backward into the vitreous, which at the base measured about one fourth of the diameter of the lens. The lens was otherwise free

from opacities and normal in every way. The central part of the lens was more myopic than the periphery. The left eye was hyperopic and had normal vision.

Posterior lenticonus is a very rare disorder, and since it is usually associated with lenticular opacities it is not often demonstrable with the slitlamp.

D. L. Tilderquist.

Pritzker, L. V. The cutaneous reaction to lens albumen. *Viestnik Opht.*, 1938, v. 13, pt. 5, p. 673.

Among 78 cases tested, a positive reaction was obtained more frequently in cataract patients than in those with transparent lenses. In 20 percent of postoperative cataract cases, the formerly negative reaction became positive 11 to 17 days after the operation. Patients with traumatic cataracts gave the greatest percentage of positive reactions.

Ray K. Daily.

Saint-Martin. New series of results of total extraction of cataract. The primary importance of preoperative and postoperative care. *Bull. Soc. Franç. d'Opht.*, 1938, v. 51, pp. 446-459.

The author presents tabular statistics concerning 237 cases of cataract removed by total extraction. A previous report had been made by the author in 1935. The results of the two series have been in agreement.

Clarence W. Rainey.

Sourdille, G. P. Statistics as to intracapsular lens extraction. *Bull. Soc. Franç. d'Opht.*, 1938, v. 51, pp. 424-431.

The author discusses the results obtained in operating upon 607 cases of senile cataract by the intracapsular method. In uncomplicated cases the vision was better than 8/10 in 87 to 89 percent. The complications were post-

operative hemorrhage, which occurred in the first week in 35 cases, and loss of vitreous, which occurred in 6.7 per cent of the cases.

Clarence W. Rainey.

Tille, H., Pillet, P., and Busnel, R. G. Microincineration and microspectroscopic analysis of the normal and pathologic lens, with special regard to two cases of black cataract. *Bull. Soc. Franç. d'Opht.*, 1938, v. 51, pp. 407-424.

The authors conclude that in normal lens substance, in white senile cataract, and in amber cataract there is no iron, copper, or zinc in appreciable quantity. Copper was found in black cataractous lens material, especially in the lens nucleus. Iron was found in black cataract, especially in the lens periphery. Hematoporphyrin was not found.

Clarence W. Rainey.

Villard, H. Systematic conjunctival flap in the operation for complicated cataract. *Bull. Soc. Franç. d'Opht.*, 1938, v. 51, pp. 459-462.

In cases where the author thinks that intraocular infection might follow cataract operation, the following procedure is used: An incision is made in the conjunctiva at the limbus, from the 9 to the 3-o'clock position, and upward dissection is done. Two vertical sutures, fastened above and below, serve to draw the flap securely down over the wound, and to cover most of the cornea.

Clarence W. Rainey.

10

RETINA AND VITREOUS

Ballantyne, A. J., Michaelson, J. C., and Heggie, J. F. Vascular changes in the retina, optic nerve, brain, and kidney: a clinical and pathologic study. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 255.

Ophthalmoscopic observation was followed by histologic examination of pipe-stem sheathing of a central retinal artery, with parallel studies of comparable arteries of the kidney and brain. The vessels showed marked proliferation of the subendothelial cells and multiplication of the elastic fibers, causing irregular thickening of the intima and narrowing of the lumen. The thickened cellular intima undergoes complete disintegration into a fatty debris producing the ophthalmoscopic picture as seen. (Illustrations.)

Beulah Cushman.

Bonnet, M. P. Pigment streaks of retina as sequela after detachment of choroid following intracapsular cataract extraction. *Bull. Soc. d'Opht. de Paris*, 1938, no. 1, Jan., p. 55.

A diabetic patient had a massive detachment of the choroid, starting in the superior temporal quadrant, becoming annular, and reaching almost to the macula. After several days the detachment disappeared. The limits of maximal detachment are marked permanently by a fine, black, broken, and sinuous line.

Harmon Brunner.

Bourne, M. C., Campbell, D. R., and Tansley, K. Retinitis pigmentosa in rats. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 234. (See *Amer. Jour. Ophth.*, 1939, v. 22, Jan., p. 94.)

Couadau and Planques. Hypertensive neuroretinitis disappearing under medical treatment, recurring during pregnancy, and with slow recovery following premature delivery. *Bull. Soc. d'Opht. de Paris*, 1938, no. 1, Jan., p. 40.

A patient 35 years of age presented in the left eye papilledema, small plaques of exudate, and peripheral hemorrhages. General measures and

acetylcholine medication were instituted. In two months the fundi were normal. One year later (the patient being seven months pregnant) there was an intense albuminuric retinitis in each eye. Seven months later all evidences of retinitis had disappeared. The case is cited as proof that in such cases findings of albuminuric retinitis are not permanent; and that they may represent nephritic exacerbation.

Harmon Brunner.

Dax, E. C. A melanosome-dispersing substance in the blood and urine of cases with retinitis pigmentosa. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 227.

A substance which will expand the melanophores of the frog is shown to be present in the blood and urine of patients with retinitis pigmentosa. Its chemical properties resemble those of the melanosome-dispersing hormone of the pituitary body. Melanophore expansion in frogs was obtained by injection of blood and urine of twenty patients with retinitis pigmentosa. A similar effect was produced by the urine in pituitary abnormalities or physiologic stress. (Illustrations.)

Beulah Cushman.

Elsberg, C. A., and Spotnitz, H. Factors which influence dark adaptation. *Amer. Jour. of Physiology*, 1937, v. 120, Dec., p. 689.

As to the effect of bright light in dark adaptation, time is of greater importance than intensity.

Theodore M. Shapira.

Elsberg, C. A., and Spotnitz, H. The neural components of light and dark adaptation and their significance for the duration of the foveal dark adaptation process. *Bull. Neur. Inst. New York*, 1938, v. 7, Sept., p. 148.

Most of the studies were made with red light. To perceive a dimly illuminated object following light adaptation, a message must be transmitted to the visual centers from the retina. The retinal sensitivity increases comparatively rapidly. A longer period of time is necessary before the energy produced in the photosensitive elements of the retina can be perceived. The time required for foveal dark adaptation is in all probability determined by the comparatively slow response of neural areas to weak stimuli after previous light adaptation.

F. M. Crage.

Jeandelize and Thomas. The influence of adrenalin and hypophyseal extract on the curve of dark adaptation in some cases of retinitis pigmentosa. *Bull. Soc. d'Ophth. de Paris*, 1937, Oct., pp. 608-612.

In such cases the visual threshold is above that of normal eyes. It was found that hypophyseal extract raised and adrenalin lowered the threshold. Drugs were administered by injection.

Harmon Brunner.

Law, F. W. A contribution to the pathology of angioid streaks. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 191.

A review of the different theories of the etiology of angioid streaks is given, with histologic description of a case in which the author showed pictures of the fundi. There was a history of injury to the right eye and an acute gastric ulcer with profuse hemorrhage to which the patient succumbed. Pathologic examination showed folds in the retina, with no breaks in Bruch's membrane.

Beulah Cushman.

Linksz, A., and Raskó, J. Examinations with the Kukan ophthalmody-

namometer. *Therapia* (Hungarian), 1938, v. 15, June, p. 126.

By means of negative pressure the eyeball is held fast and pressed against the rim of a suction cup of 13-mm. diameter. Thus the intraocular pressure is raised, and the appearance and collapse of the arterial and venous pressure are observed with the ophthalmoscope. The eye having an autochthonous regulatory mechanism, the intraocular pressure is in great degree independent of the general blood pressure. The authors found great variations from the ideal rule that the diastolic pressure in the brachial is twice as high as the retinal diastolic pressure. Further they established the following connections: If the intraocular pressure rose above 25 mm. Hg the retinal diastolic pressure was always found to be higher than 40 mm. Hg, and if the retinal diastolic pressure was greater than 65 mm. Hg the ocular tension was higher than 24 mm. Hg. Similarly, if the intraocular pressure was less than 13 mm. Hg the retinal diastolic pressure was never higher than 40 mm. Hg. While in one man the diastolic pressure of the brachial was 65 mm. Hg, the retinal diastolic pressure differed in the two eyes, being 40 and 60 mm. Hg respectively, while the intraocular tension of the two eyes correspondingly was 16 and 25 mm. Hg. R. Grunfeld.

Michaud, Paul. The oculocardiac reflex observed after a retinal-detachment operation. *Bull. Soc. d'Opht. de Paris*, 1938, March, p. 136.

Thirty-six hours postoperatively the patient had an attack of vomiting and pulse was reduced to 40. The bradycardia was relieved by atropine. The site of operation was in the superior nasal quadrant of the right eye. It is presumed the ciliary nerves were dam-

aged, causing a central vagus stimulation. Harmon Brunner.

Nagy, Ferenc. Vasodilator substances in diseases of the eyeground. *Magyar Orv. Arch.* (Hungarian), 1938, v. 39, p. 643.

The author describes four cases in which he obtained some improvement in visual acuity by amyl-nitrite inhalation or acetylcholin injection. The treatment is indicated in albuminuric retinitis, choroiditis, atrophy of the optic nerve, retinitis pigmentosa, and so on. Although the vasodilators frequently fail to fulfil the expectations based upon them, the few instances in which they improve vision and increase the visual field make it desirable to try their application in every case indicated. R. Grunfeld.

Offret, G. Bilateral venous retinal lesions in a young girl, preceding by two months the appearance of recurrent vitreous hemorrhages. *Bull. Soc. d'Opht. de Paris*, 1937, Oct., pp. 578-587.

This patient had a vasomotor instability more evident in the extremities. Complete physical studies and tests revealed only a prolonged blood-clotting time. The fundi showed venous tortuosities, thrombi, flame-shaped retinal hemorrhages, and frequent areas of periphlebitis. These became more marked distally. No immediate cause of the vitreous hemorrhages was found in spite of hospitalization. Etiology is discussed. (2 plates, 6 references.)

Harmon Brunner.

Strachov, V. P. Intracapsular cataract extraction. *Viestnik Opht.*, 1938, v. 13, pt. 4, p. 454. (See *Amer. Jour. Ophth.*, 1939, v. 22, Feb., p. 230.)

Vilenkina, A. I. The fundus in the diagnosis, prognosis, and course of hypertension. *Viestnik Opht.*, 1938, v. 13, pt. 4, p. 470.

A tabulated report of examination of 28 patients with hypertension relative to blood chemistry, blood pressure, retinal pressure, and fundus changes. The author shows that the ocular findings are indicative of the phase, character, and course of hypertension. He therefore urges close coöperation between internist and ophthalmologist. He suggests the term "hypertensive fundus" for the early stages of essential hypertension, and "arteriosclerotic retinopathy" for its late stages. "Angiospastic retinitis," indicative of malignant hypertension, should be replaced by the term "ischemic retinopathy."

Ray K. Daily.

Wilson, R. P. Neuroretinitis (probably bilharzial in origin). *Giza Mem. Ophth. Lab.*, 1937, 12th ann. rept., pp. 88-89.

This is the second case in recorded medical literature of neuroretinitis of bilharzial origin. The first case was reported in 1924. Both patients were young males, aged respectively 25 and 21 years. In each case the left eye was affected and the fundus lesions consisted of several rounded white or yellowish-white spots near the temporal side of the disc or in relation to the temporal vessels. In both cases the size of the spots was the same (about 1/3 d. d.) and small macular hemorrhages were present. Both cases cleared up under antimony tartrate injections.

Lawrence G. Dunlap.

Wilson, R. P. Recurrent intraocular hemorrhages (Eales's disease) in two brothers. *Giza Mem. Ophth. Lab.*, 1937, 12th ann. rept., pp. 90-92.

Brothers, aged 29 and 30 years, developed retinal hemorrhages which cleared up under injections of calcium and vitamin C on alternate days over a period of seven weeks. One regained practically normal vision and the other vision of 0.1, with continued recurring hemorrhages. Lawrence G. Dunlap.

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Baltin, M. M. Roentgenography of the optic canal. *Viestnik Opht.*, 1938, v. 13, pt. 5, p. 613.

A comprehensive review of the subject, and a description of the author's method, which employs a cassette covering both orbits, and two X-ray tubes. The indications are illustrated by case reports. (Illustrations.)

Ray K. Daily.

Fridman, S. I. Data on the use of amyl nitrite in the therapy of optic atrophy. *Viestnik Opht.*, 1938, v. 13, pt. 6, p. 784.

A report of three cases of optic atrophy and three cases of retrobulbar neuritis, treated without improvement with amyl nitrite inhalations.

Ray K. Daily.

Gasova, O. A., and Milovidova, A. H. A case of brucellosis involving the nervous system, with bilateral optic neuritis as the initial symptom. *Viestnik Opht.*, 1938, v. 13, pt. 4, p. 538.

A young woman, nineteen years old, was taken sick with an acute angina and bilateral optic neuritis. The joints became involved later, and two months after onset of the disease the patient developed spinal myelitis. The diagnosis was made serologically. Vision improved from light perception to 0.01 in

the right eye and 0.05 in the left, with central scotomata remaining.

Ray K. Daily.

Jensen, Peter. Four cases of quinine poisoning. *Oft. Selskab i Köbenhavn's Forhandlinger*, 1937-1938, pp. 23-25. In *Hospitalstidende*, 1938, Dec. 13.

The patients were young women who took the drug in dosages of five to twenty grams to produce abortion. All promptly developed nausea, weakness, noises in the ears, and loss of vision. The pupils were dilated and did not react to light, and the fundi showed a picture resembling that of embolus of the central artery.

Amyl nitrite, acetylcholin, and diuretin were used in treatment. In all instances the vision finally became normal, but the visual fields remained contracted and the discs pale.

D. L. Tilderquist.

Khurgina, E. A. Sympathectomy in optic atrophy. *Viestnik Opht.*, 1938, v. 13, pt. 6, p. 792.

A report of six cases of pericarotid sympathectomy with improvement only in one case in which preoperative vision was 0.5.

Ray K. Daily.

King, J. E. J. Oxycephaly. A new operation and its results. *Arch. Neur. and Psychiatry*, 1938, v. 40, Dec., p. 1205.

In oxycephaly, a premature closure of the skull sutures prevents normal expansion of the brain in its growth. Ocular results of this condition include exophthalmos, papilledema, and later optic atrophy. The author reports the case of an eight-year-old boy operated on in two stages, first on one side of the skull, and ten weeks later on the other side. The operative procedure consisted

in making a number of burr holes through the skull about 5 cm. apart, and connecting these holes by linear cuts through the bone. The result was a mosaic of skull fragments resting on the dura, allowing the brain to expand by further separation of the fragments. Subjective and objective improvement of the patient were noted. (Illustrations.)

George A. Filmer.

McAlpine, Douglas, Familial neuromyelitis optica: its occurrence in identical twins. *Brain*, 1938, v. 61, Dec., p. 430.

The clinical and pathological features of neuromyelitis optica as it occurred in identical twins are described. It is concluded that it is a distinct member of the demyelinating group of diseases.

T. E. Sanders.

Skydsgaard, H. Intermittent choked discs in intracranial tumors. *Oft. Selskab i Köbenhavn's Forhandlinger*, 1937-1938, pp. 25-32. In *Hospitalstidende*, 1938, Dec. 13.

Two cases of intracranial tumor are cited in which over a period of five years or more there appeared recurring attacks of increase in intracranial pressure with marked choked disc, followed by improvement in symptoms and disappearance of the papilledema. In one instance a tumor was found in the right frontal lobe and the periodic attacks had undoubtedly been caused by intermittent hemorrhage from the tumor. In the other case, the tumor was located at the base of the brain near the tentorial incisure, and caused direct pressure and blocking of the ventricles, especially the third. Since the tumor was partly cystic the periodicity of the pressure might be explained by intermittent emptying and refilling of the cysts.

D. L. Tilderquist.

Watkins, A. L. The cerebrospinal fluid in optic neuritis, "toxic amblyopia," and tumors producing central scotomas. *New England Jour. Med.*, 1938, v. 220, Feb. 9, pp. 227-231.

The cerebrospinal-fluid findings in 120 cases of acute and chronic retrobulbar neuritis, "toxic amblyopia," and tumors producing central scotomas are reported. In acute retrobulbar neuritis without demonstrable cause the spinal fluid was normal except in older cases associated with known multiple sclerosis (25 to 50 percent). In these there were a few lymphocytes, a high normal protein and a strong first-zone gold-sol reaction. The spinal fluid was normal in so-called chronic retrobulbar neuritis, and in 95 percent of the cases of probable "toxic amblyopia." In all patients with tumor or aneurysm producing central scotoma, the spinal-fluid protein was increased two to five times. This proved to be a valuable differential point.

T. E. Sanders.

Whiteside, W. C. Leber's hereditary optic neuritis through six generations—a sterilization problem. *Canadian Med. Assoc. Jour.*, 1938, v. 39, Oct., p. 347.

The patient was one of 23 afflicted male members of the same family, through six generations. A brief description of the disease and its incidence and mode of transmission is given. Closer and continued coöperation between ophthalmologist and surgeon is urged, so that such a hereditary link may be broken by proper sterilization procedure.

F. M. Crage.

12

VISUAL TRACTS AND CENTERS

El-berg, C. A., and Spotnitz, H. A comparison of a series of olfactory and visual tests for the localization of tu-

mors of the brain. *Bull. Neur. Inst. New York*, 1938, v. 7, Sept., p. 165.

In 126 patients both olfactory and visual tests were made and in 31 of these a tumor of the brain was present, localized and verified by encephalography or ventriculography, and operation or autopsy. The experiences of the authors indicate that these tests are useful for localization of supratentorial tumors of the brain and are mutually confirmatory. Exact and probable localizations of tumors of the various lobes by these tests are discussed.

F. M. Crage.

Guillermín, M., and Pesme, J. Pneumococcic arachnoiditis of the optic chiasm. *Bull. Soc. d'Opht. de Paris*, 1938, no. 1, Jan., p. 16.

The report relates to a patient complaining of abrupt diminution of vision to O.D. 0.01, O.S. 0.2, and having bilateral papilledema, contracted fields, and a quadrant field defect. All laboratory tests and examinations were negative. The symptoms progressed. In the search for infection, the optic chiasm was exposed and was found to be covered with a greatly congested arachnoid. The optico-chiasmal cistern was greatly distended with cloudy fluid. The spinal fluid was consistently negative. Later general meningitis developed. Necropsy showed the optic chiasm to be the site of primary infection. Routes of infection are discussed. The authors present the case in the belief that many light cases are overlooked and undiagnosed, and also to refute doubt of the existence of the arachnoid in this area.

Harmon Brunner.

13

EYEBALL AND ORBIT

Benedict, W. L. Problems in the diagnosis of abscess and tumor of the

orbit. *Amer. Jour. Ophth.*, 1939, v. 22, March, pp. 292-297; also *Trans. Pacific Coast Oto-Ophth. Soc.*, 1938, 26th mtg.

Berz, A. L. An atypical case of true posterior staphyloma. *Viestnik Opht.*, 1938, v. 13, pt. 4, p. 545.

A report of a case in a high myope 39 years old. The optic disc was not included in the staphyloma, and the ectatic area was darker in color than the rest of the fundus. The author regards this phenomenon as an anomaly in development; he cites the presence of a misplaced lacrimal punctum in the same eye as supporting this contention.

Ray K. Daily.

Bonnet and Paufigue. Unilateral exophthalmos related to a large cystic tumor of the greater wing of the sphenoid. *Bull. Soc. d'Opht. de Paris*, 1938, March, p. 173.

A male of 57 years had exophthalmos progressive since 1917. There was a large cyst in the greater wing of the sphenoid, and since 1921 the contents of the cyst had been drained by puncture several times a year. Cystic formation of the sphenoid crowding into the orbit could be palpated laterally. There was no pain. The type of cyst was not known. Discussion brought out two more cases of similar nature. One died of another cause. One had become stationary for several years.

Harmon Brunner.

Dragoiu, I., and Crisan, C. Correlation between the development of the crystalline lens and that of the optic vesicle, in relation to an ocular anomaly. *Bull. de l'Acad. de Méd. de Roumanie*, 1938, v. 5, no. 3, pp. 305-308.

In examining serial frontal sections of the head of a frog tadpole which to the naked eye showed left anophthal-

mia, there was found in the left orbit an oval formation surrounded by abundant mesenchymatous tissue. Detailed study showed that the primary optic vesicle had been prematurely separated from the cerebral vessels, probably by mechanical rupture of the optic pedicle. There was no trace of vitreous, cornea, crystalline lens, or iris; but well-developed oculomotor muscles were found inserted into the primitive sclera.

W. H. Crisp.

Lamb, H. D. The retina in septic and chronic endophthalmitis of ectogenous origin. *Amer. Jour. Ophth.*, 1939, v. 22, March, pp. 258-266.

Magitot. Subconjunctival injection of adrenalin, and exophthalmos in man. *Bull. Soc. d'Opht. de Paris*, 1937, Dec., p. 721.

The injection was made to secure mydriasis in a case of uveitis. In ten minutes retraction of the upper lid and mild exophthalmos developed. When yohimbine was injected before the adrenalin this did not occur. Though the experience is common in animals, the author finds no previous recorded instance in man. He attributes it to action upon the sympathetics.

Harmon Brunner.

Marine, David. Studies on the pathological physiology of the exophthalmos of Graves' disease. *Annals of Internal Med.*, 1938, v. 12, Oct., p. 443.

Important factors in production and maintenance of exophthalmos are increased anterior pituitary activity, relative or absolute thyroid insufficiency, and increased functional activity of the interstitial cells of the gonads. The exophthalmos following thyroidectomy in rabbits can be cured by the administration of thyroxin or by gonadectomy.

Other factors may be the functional activity of the adrenal cortex and Ca and P metabolism. (Illustrations.)

George A. Filmer.

Naffziger, H. C. Progressive exophthalmos associated with disorders of the thyroid gland. *Annals of Surg.*, 1938, v. 108, Oct., p. 529.

Naffziger considers the status of three patients who have progressive exophthalmos associated with disorders of the thyroid gland and in whom the exophthalmos has progressed to the point where not only the vision but the lives of the patients are threatened.

Theodore M. Shapira.

Nikhinson, A. G. The orbital complications of sinusitis in childhood. *Viestnik Opht.*, 1938, v. 13, pt. 4, p. 530.

A report of two cases of orbital phlegmon complicating nasal sinusitis. In both, the orbits were drained externally and the sinuses intranasally. The final result was recovery, with loss of vision in one case. Ray K. Daily.

Polonskii, S. P. Recurrent exophthalmos and choked disc caused by Quincke's edema. *Viestnik Opht.*, 1938, v. 13, pt. 5, p. 669.

The patient came from a family with cardiovascular disturbances, and from childhood was subject to attacks of migraine and urticaria. When she was 28 years old the attacks of urticaria were followed by exophthalmos, reduced visual acuity, and choked disc in the left eye. For the first three years the eye returned to normal between the attacks. After that there remained between the attacks some exophthalmos, slight choking of the disc, and some reduction of visual acuity. The history and course of the disease led the author to conclude that this was a case of Quincke's edema.

Ray K. Daily.

Rameev, P. C. Orbital cellulitis in erysipelas of the face. *Viestnik Opht.*, 1938, v. 13, pt. 5, p. 667.

A report of a case with recovery under conservative treatment.

Ray K. Daily.

Sobol, I. M. Clinical observations on the role of the nasal sinuses in inflammations of the orbit. *Viestnik Opht.*, 1938, v. 13, pt. 4, p. 524.

A tabulated report of ten cases of orbital cellulitis, with recovery in eight. The author maintains that conservative therapy is ineffective, and drainage of the orbit alone without simultaneous drainage of the nasal sinuses is inadequate.

Ray K. Daily.

Wald, G., Jeghers, H., and Armino, J. An experiment in human dietary night-blindness. *Amer. Jour. of Physiology*, 1938, v. 123, Sept. 1, p. 732.

The dark adaptation of a human subject was measured at regular intervals during a long control period, and during a subsequent period on a diet containing only 50 to 200 U. S. P. units daily of vitamin A, but otherwise complete. A first effect of the deficiency diet was noted within 24 hours. Within 25 days, the threshold of the dark-adapted rods had risen about fifty times that of the dark-adapted cones, which had risen fourfold. Following temporary cure of the initial night-blindness with a single dose of vitamin A, hemeralopia reappeared with greatly increased rapidity. The development of hemeralopia was repeatedly checked temporarily by oral administration of vitamin A or carotene. After intramuscular injection of colloidal carotene the hemeralopia threshold improved to within seven minutes.

Theodore M. Shapira.

Wilson, R. P. Coloboma of the upper lid with microphthalmos and dermoid of cornea. Giza Mem. Ophth. Lab., 1937, 12th ann. rept. pp. 82-85.

A female infant, aged 27 days, had a soft mass about 1 cm. in diameter in the anterior part of the right orbit, protruding through a wide coloboma in the nasal half of the upper lid. The coloboma involved about one half of the ciliary margin and portions of the normal lid lay free on each side of the protruding mass. The tumor extended backward into the orbit and the conjunctiva had a bluish tinge suggestive of underlying sclera. Eight months later the condition having remained stationary, the tumor was excised. On the back of the tumor was a small pigmented cyst (microphthalmic eye) the size of a small pea, and with tough walls. The tumor mass replaced the cornea, anterior chamber, and iris, and there was no trace of lens. The posterior portion of the specimen showed a narrow cavity lined by retinal pigment epithelium.

Lawrence G. Dunlap.

Wilson, R. P. Streptothricial granuloma of orbit. Giza Mem. Ophth. Lab., 1937, 12th ann. rept., p. 70.

A female aged fifteen years, with swelling and drooping of the left upper eyelid for about three months, had a firm hard tumor extending along the whole of the superior orbital margin and deep into the orbit, attached to the periosteum but not to the skin. A piece removed for diagnostic examination showed mycelial filaments, polymorphonuclears, plasma cells, lymphocytes, macrophages, giant cells, and newly formed capillaries, typical of the nodules of actinomycosis.

Lawrence G. Dunlap.

14

EYELIDS AND LACRIMAL APPARATUS

Csillag, Franz. Primary chancre of the eyelid. Orvosi Hetilap (Hungarian), 1939, v. 83, Jan. 7, p. 11.

A portion of the lower eyelid near the inner canthus became swollen and subsequently thickened and hard. A yellowish crust formed upon the surface and later the upper eyelid showed a similar change. No ulceration was noted. Although the epithelium became desquamated the denuded surface was not moist. The tear duct was not permeable. Close to the duct a hard nodule was palpable. The preauricular gland was enlarged. The Wassermann reaction was strongly positive. Since upon institution of antisypilitic treatment a rapid cure set in, the condition was diagnosed as primary syphilitic ulcer.

R. Grunfeld.

Desvignes, Pierre. Syphilis of the lacrimal duct simulating acute dacryocystitis. Bull. Soc. d'Ophth. de Paris, 1938, no. 1, Jan., p. 13.

The author says that a review of literature shows only twelve cases of acute syphilitic infection of the sac. A female aged 36 years had all the signs of an acute infection. Diagnosis was suggested by a nasal ulcer; and was confirmed serologically and therapeutically.

Harmon Brunner.

Morgan, O. G. Observation on the treatment of epiphora, with special reference to some cases treated by dacryocystorhinostomy. Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 1, p. 163.

A review of the different methods of treatment of congenital occlusion of the lacrimal duct is given, with details of operative interference according to the

Dupuy-Dutemps modification of Toti's method. This technique was used satisfactorily in children, and in adults where probing had failed.

Beulah Cushman.

Offret, A., and Offret, G. **Operative attempt in a case of Marcus-Gunn phenomenon.** Bull. Soc. d'Ophth. de Paris, 1938, no. 2, Feb., p. 61.

The patient had an associated ptosis when the eye was at rest, and a tremor of the upper lid when the jaw was moved to the opposite side. A longitudinal strip of tarsus was sutured to the insertion of the superior rectus. The ptosis was relieved and the jaw winking stopped. (9 references.)

Harmon Brunner.

Palin, Anthony. **Abnormal angulation of palpebral fissures.** Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 1, p. 457.

A plastic operation is described for repair of the palpebral fissure, which angulated down 15°. A long triangular flap of skin and orbicularis muscle base outward was transplanted from the upper lid to the lower to raise the canthus.

Beulah Cushman.

Paradoksov, L. F. **Surgical treatment of cicatricial entropion of the lower lid.** Viestnik Ophth., 1938, v. 13, pt. 4, p. 550.

The author's procedure consists in excision of a strip of skin over the tarsus, splitting the tarsus, and suturing in such a manner that the upper segment of the tarsus with its overlying conjunctiva is turned on its axis and becomes displaced upward and forward.

Ray K. Daily.

Saint-Martin, R. de. **A modification of the Motais technique for the correction of ptosis.** Bull. Soc. d'Ophth. de Paris, 1938, no. 2, Feb., p. 100. (See

Amer. Jour. Ophth., 1938, v. 21, Dec., p. 1433.)

Shershevskaja, O. I. **Congenital coloboma of the lids.** Viestnik Ophth., 1938, v. 13, pt. 6, p. 822.

A report of two cases. In one the colobomata represented the only abnormality. In the second case there were cicatrices on the skin of the lids, and shortening of the bridge of the nose and of the alveolar process of the superior maxilla. In this case the author attributes the anomaly to amniotic adhesions. The pathogenesis of the first case is not clear.

Ray K. Daily.

Valière-Vialeix. **A case of enormous distention of the lacrimal sac.** Bull. Soc. d'Ophth. de Paris, 1937, Dec., p. 696.

Dilatation resulted from chronic dacryocystitis. The sac held 30 c.c. of fluid. It is the second largest reported.

Harmon Brunner.

Venco, Luigi. **The technique of dacryocystorhinostomy by the external route.** Rassegna. Ital. d'Ottal., 1938, v. 7, Sept.-Oct., pp. 593-612.

In an experience with 200 cases of dacryocystorhinostomy, Venco has found certain procedures of value. He administers a blood coagulant in advance and gives a sedative before the operation. Novocaine infiltration is done externally and a pledget of 5-percent cocaine with adrenalin is placed in the nose. The incision is slightly longer than that for removal of the sac. After the skin incision is made a diathermy bistoury is used for deep dissection.

The author discusses various measures for checking hemorrhage. The sac is freed from surrounding tissues, except at the canaliculi and the dome, and a colored fluid is injected into the sac to aid identification. Bone removal

is done with an 8-mm. electrically driven trephine. The sac and nasal mucous membrane are united by 000 catgut or silk, and when suturing is impossible a rubber tube is tied in place.

Eugene M. Blake.

Wilson, R. P. Elephantiasis lymphangioides of the eyelids, Giza Mem. Ophth. Lab., 1937, 12th ann. rept., pp. 85-86.

A female, aged sixteen years, was treated with a red-hot cautery for a boil on the lower border of the right jaw, over the external maxillary vessels. A dense scar over the angle of the jaw was followed by swelling of the face and thickening and ptosis of the right upper eyelid. Tarsectomy was performed to reduce the thickness and weight of the lid, and microscopic examination of the excised tissue showed greatly dilated lymphatics and filling of the subcutaneous tissues with myxomatoid material.

Lawrence G. Dunlap.

Wilson, R. P. Retention cyst of accessory lacrimal gland (dacryops). Giza Mem. Ophth. Lab., 1937, 12th ann. rept., p. 59.

A female aged 25 years had in the vicinity of the right lacrimal gland a swelling of the right upper eyelid of ten days duration. It appeared to be cystic, lobulated, and freely movable, and of the size of a large chestnut. It was removed. The pathologic diagnosis was retention cyst of the accessory lacrimal gland, secondary to ascending inflammation.

Lawrence G. Dunlap.

Zatz, L. B. An operation for ectropion of the lower lid. Viestnik Opht., 1938, v. 13, pt. 4, p. 554.

A description of the Imre operation. (Illustrations.) Ray. K. Daily.

15

TUMORS

Doherty, W. B. Melanosarcoma of the iris. Amer. Jour. Ophth., 1939, v. 22, March, pp. 239-249.

Lane, L. A. Occupation in relation to cancer of the eye and adnexa. Amer. Jour. Ophth., 1939, v. 22, March, pp. 267-273.

Meighan, S. and Michaelson, J. C. A case of glioma retinae with special reference to the mode of spread. Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 1, p. 208.

The authors give the clinical and pathological findings in a 3½-year-old child with bilateral retinal glioma. The involvement of the right eye extended to the optic disc, choroid, and anterior part of the nerve. The progress backward in the nerve was interrupted for 1 mm. Its reappearance in the nerve continued for 0.60 mm. and was associated with partial necrosis of nerve fibers and implantation of small secondary nodules in the subarachnoid space. The authors conclude that this examination exemplifies the fallacy of basing operative procedure on the condition of the cut end of the optic nerve, and they advise consideration of exenteration of the orbit if the choroid is found to be involved.

Beulah Cushman.

Montpellier, J., Toulant, P., Foissini, J. Ganglio-neuro-schwanno-spongioblastoma of the orbit. Ann. d'Ocul., 1939, v. 176, Jan., pp. 18-27.

An eight-year-old Arab boy had proptosis of the left eye of two-months duration without other symptoms. An adherent solid tumor was removed from the orbit. Deep X-ray therapy was given for two months. Seven months after the first operation the tumor had

recurred with marked proptosis, loss of vision, and corneal erosion. Exenteration of the orbit was followed by further radiation.

Histologic examination of the first specimen showed a malignant ganglioneuroma. The second specimen was a classical spongioblastoma.

The literature on neurogenic tumors of the orbit is discussed, and the possibility of two separate tumors is dismissed in favor of one complex ganglio-neuro-schwanno-spongioblastoma. (Bibliography.) John M. McLean.

Wilson, R. P. Adenocarcinoma of meibomian gland. Giza Mem. Ophth. Lab., 1937, 12th ann. rept., p. 45.

A female aged 45 years had noted a growing tumor of the left upper eyelid for the previous two years. Two operations had been unsuccessful. After removal the histopathologic appearances suggested that the growth had arisen from a sebaceous (meibomian) gland. Lawrence G. Dunlap.

Wilson, R. P. Capillary angioma secondary to xeroderma pigmentosum. Giza Mem. Ophth. Lab., 1937, 12th ann. rept., p. 47.

A female aged nine years had begun to develop signs of xeroderma pigmentosum when only one year old. This progressed until pigmented areas and atrophic patches were scattered over the whole body. A red sessile tumor the size of a small bean, attached to the ciliary border of the intermarginal strip of the left upper eyelid, was removed. Photophobia was due to diffuse trachomatous keratitis. Tumor sections showed a typical capillary angioma, with no evidence of malignancy.

Lawrence G. Dunlap.

Wilson, R. P. Cavernous hemangioma of bulbar conjunctiva. Giza Mem. Ophth. Lab., 1937, 12th ann. rept. p. 52.

A male aged 35 years had noted for five years a small red mass on his right eye, 3 mm. in diameter and lying midway between the caruncle and the nasal limbus. It was movable with the conjunctiva. Trachoma accompanied the condition. Pathologic examination revealed the type of tumor.

Lawrence G. Dunlap.

Wilson, R. P. Fibroma of eyelid. Giza Mem. Ophth. Lab., 1937, 12th ann. rept., p. 39.

A female aged 45 years had noted for two years a small hard lump in the lower left eyelid gradually increasing in size, painless, nonadherent to skin but adherent to the lower orbital margin, and causing a mechanical obstruction to vision. Pathologic sections showed the typical appearances of a soft fibroma. Lawrence G. Dunlap.

Wilson, R. P. Lipoma of bulbar conjunctiva. Giza Mem. Ophth. Lab., 1937, 12th ann. rept., p. 53.

A female aged eleven years had a soft yellowish rounded tumor, 4 by 4 by 3 mm., midway between the outer canthus and the temporal margin of the limbus, freely movable. It was found to be a lipoma of the bulbar conjunctiva. Lawrence G. Dunlap.

Wilson, R. P. Malignant melanoma of eyelid. Giza Mem. Ophth. Lab., 1937, 12th ann. rept., p. 42.

A female aged 27 years had noted three months previously a lump the size of a pea in her left upper eyelid. When examined she was found to have a large firm tumor of the middle third of the lid, about the size of a walnut,

not attached to the overlying skin, round, apparently cystic, and causing mechanical ptosis. There were enlarged glands in the parotid region and also in the neck. The tumor was found to be a typically malignant melanoma with secondary metastases to the glands.

Lawrence G. Dunlap.

Wilson, R. P. Mixed tumor of lacrimal gland. Giza Mem. Ophth. Lab., 1937, 12th ann. rept., p. 61.

Three cases were seen during the year. One, in a female aged 35 years, was of the "mixed salivary gland" type. One of six months duration, in a female aged 25 years, caused the eye to be displaced markedly downward and forward and restricted the eye movements. The third, in a female aged forty years, was of five years duration.

Lawrence G. Dunlap.

Wilson, R. P. Neurofibroma of the eyelid. Giza Mem. Ophth. Lab., 1937, 12th ann. rept., p. 40.

A female aged sixteen years, with a swelling over her left eye since birth, gradually enlarging, and with marked ptosis of the left upper lid, was found to have a typical neurofibroma.

Lawrence G. Dunlap.

Wilson, R. P. Pigmented tumor of the optic-disc margin (melanoma). Giza Mem. Ophth. Lab., 1937, 12th ann. rept., pp. 92-94.

A female aged 35 years complained of defective vision for the previous ten days, and was found to have a right optic disc almost completely obscured by a dense black globular mass about twice the diameter of the left disc. The first diagnosis was melanotic sarcoma, but when the patient refused operation and was examined a year later, the tu-

mor had not altered either in size or appearance. There was no detached retina and vision was 2/60. The diagnosis was changed to benign melanoma.

Lawrence G. Dunlap.

Wilson, R. P. Reticulum-cell sarcoma of lacrimal-sac region. Giza Mem. Ophth. Lab., 1937, 12 ann. rept., p. 66.

A female aged 36 years, with a lump at the inner canthus of her left eye for the past three months, was thought to have a mucocele of the lacrimal sac, but at operation was found to have a solid tumor occupying the region of the sac. It was removed, but six weeks later there was a mass the size of a walnut at the site of the previous operation, with no glandular involvement. This was removed, and a month later the tumor had recurred, causing proptosis. Ten X-ray treatments were given, the swelling diminished, and six months later the patient was completely cured, but the optic disc was atrophic and vision nil.

A second similar case occurred in a male aged twelve years, in whom a lump had been noted in the region of the left lacrimal sac for the past six months. The tumor was fixed to the deeper tissues but not to the overlying skin. There was no glandular enlargement anywhere. The tumor was found to arise in the wall of the lacrimal sac. The patient could not be followed after removal of the tumor.

Lawrence G. Dunlap.

Wilson, R. P. Sarcoma of limbus. Giza Mem. Ophth. Lab., 1937, 12th ann. rept., p. 55.

A male aged fifty years had noted, two months previously, a small pale fleshy mass of the left eye at the limbal margin. It developed into a large fun-

gating tumor, covering the cornea and encroaching on the sclera, mushroom-shaped, about 1 cm. thick, and firmly attached by a broad base to the cornea and the nasal corneoscleral margin. It was friable and bled easily. Specimens were removed and the eye was afterward enucleated. The tumor was a myxosarcoma. Lawrence G. Dunlap.

16

INJURIES

Anguis, Tullio. Ocular lesions from the juice of euphorbia (spurge). *Rassegna Ital. d'Ottal.*, 1938, v. 7, Sept.-Oct., pp. 649-660.

Euphorbia is an annual plant which blossoms in spring and summer, and occurs frequently in the Mediterranean basin. There are many varieties and they are known to the farmers as the "bad weeds." The juice and seeds of these plants are irritating, vesicant, purgative, and emetic. Thus they have many therapeutic uses. They have been reported to cause conjunctivitis, keratitis, and iridocyclitis. The author reports his experiments with fifteen rabbits, instilling the juice into the conjunctival sac. This regularly produced a conjunctivitis with increase of eosinophiles in the secretion, but no other lesions. Eugene M. Blake.

Block, H. M. Ocular birth injuries of the new-born. *Texas State Jour. of Med.*, 1938, v. 34, May, p. 43.

Block lists and discusses many ocular birth injuries of the new-born.

Theodore M. Shapira.

Bogdonovich, I. I. Changes in the blind spot of the uninjured eye in ocular traumatism. *Viestnik Opht.*, 1938, v. 13, pt. 4, p. 534.

The conclusion of the study is that

in perforating ocular injuries and in intraocular foreign bodies the reflex changes in the uninjured eye do not include enlargement of the blind spot.

Ray K. Daily.

Bonnet and Bonamour. "Chrysiasis": impregnation of the cornea by gold salts. *Bull. Soc. d'Opht. de Paris*, 1937, Dec., p. 751.

Three more cases of deposition of gold in the cornea. Each had received gold-salt injections for pulmonary tuberculosis. Small granular deposits were noted in the corneal parenchyma immediately anterior to Descemet's. One case showed deposition in all layers. On account of the occurrence of a conjunctivitis in all cases, with limbal edema, and, in one case, outlining of a meshwork at the limbus by granules, the authors believe the lymphatics carry the gold granules into the cornea. Examination of patients receiving this treatment showed no deposition in those receiving less than three grams of the salt. Harmon Brunner.

Bonnet and Chauvire. Circular rupture of the choroid from contusion of the globe. *Bull. Soc. d'Opht. de Paris*, 1937, Dec., p. 749.

Observations on a patient seen nine days after an automobile accident. A circular vitreous opacity of a diameter greater than that of the lens was observed posterior to the lens. The edges were somewhat thicker, and were festooned and fringed with pigment. Through this diaphanous opacity, pigment granules were seen on the disc and retina, with the typical findings of commotio retinae. It is believed the hyaloid had been torn loose from its ciliary attachments. Similar findings had been observed in traumatic cases; the circu-

lar opacity usually disappearing on or about the ninth day.

Harmon Brunner.

Brodskii, B. S. **Ammonia burns of the eye and their treatment.** *Viestnik Ophth.*, 1938, v. 13, pt. 4, p. 565.

A laboratory study on rabbits. On its basis the author advises early intravenous administration of hypertonic salt solution in addition to local treatment in mild cases, or a Denig transplantation in severe cases.

Ray K. Daily.

Bujadoux, M. **Marking the anterior pole with lipiodol in ocular roentgenography.** *Bull. Soc. d'Ophth. de Paris*, 1938, March, pp. 179-180.

By means of injection of lipiodol at the 12 and 6 o'clock positions at the limbus, foreign bodies may be accurately localized without other apparatus. The author emphasizes that thick lipiodol must be used, or it will spread. (Case report and X rays.)

Harmon Brunner.

Carter, T. J. **Electric welding, particularly eye hazards and protective measures.** *U. S. Naval Med. Bull.*, 1939, v. 37, Jan., pp. 138-142.

Besides burns, electric shock, and inhalation of gases and dusts, the most important hazard of electric welding is injury to the ocular media and retina by the absorption of radiant energy. The rays emitted by the electric welding process include most of the ultraviolet, all of the visible rays, and most of the infrared rays. The conjunctiva and cornea absorb most of the ultraviolet, which gives rise to a severe conjunctivitis and keratitis. The chief cause of injury to the lens is the infrared, the heat of which may cause cataract. Visible light penetrates to the retina and

may cause permanent retinal injury as in eclipse blindness. Adequate eye protection should be given in all occupations subject to such radiation. The use of green or black goggles is suggested.

T. E. Sanders.

Freedman, S. V. **The technique of intraocular foreign-body extraction with the magnet-solenoid.** *Viestnik Ophth.*, 1938, v. 12, pt. 4, p. 503.

This type of magnet permits of the simultaneous use of two magnetic applicators. This combination proved of advantage in extracting a foreign body entangled in the iris. By holding one magnet against the center of the cornea and the other in the wound at the limbus, the serrated foreign body was liberated from the iris and extracted. (Illustrations.)

Ray K. Daily.

Genet. **Mustard gas, conjunctival ischemia, delayed corneal ulcer.** *Bull. Soc. d'Ophth. de Paris*, 1937, July p. 409.

War injury by the gas occurred in 1918, and corneal ulceration in 1931 and 1937. White ischemic areas on the congested conjunctiva were considered as gas burns. The case aroused medico-legal interest.

Harmon Brunner.

Lancaster, W. B. **The technique of extraction of intraocular foreign bodies.** *Amer. Jour. Surg.*, 1938, v. 42, Oct., pp. 14-24.

This excellent article should be read by everyone doing industrial work. The newer methods of making the incision with the diathermy knife to prevent hemorrhage, and the use of diathermy needles around the incision to prevent retinal detachment, are discussed. (4 references.)

Ralph W. Danielson.

Magitot and Dubois-Poulsen. **Localization of intraocular foreign bodies by**

scleral illumination. *Bull. Soc. d'Opht. de Paris*, 1937, Oct., pp. 621-626.

If the media permit, the quadrant containing the foreign body is determined. The scleral lamp is then passed beneath the conjunctiva, and the spot coinciding with the foreign body is marked. Incision is made at this point. The authors claim that trauma is avoided by the procedure.

Harmon Brunner.

Makarov, H. H. Several cases of central retinitis caused by looking at a solar eclipse. *Viestnik Opht.*, 1938, v. 13, pt. 5, p. 692.

A report of four cases. In one case the injury resulted from one rapid glance at the sun; and in another it occurred in spite of the fact that the patient was wearing blue glasses. The latent period in such cases is much shorter than in cases of electric ophthalmia caused by exposure to the arc light; the scotoma in the visual field appearing after 10 to 15 minutes, while electric ophthalmia develops 6 to 8 hours after exposure.

Ray K. Daily.

Malbran, Jorge. Traumatic lesions of the iris; partial disappearance of the iris; total disappearance (irideremia). *Arch. de Oft. de Buenos Aires*, 1938, v. 13, Aug., p. 431.

The author reports two cases of disappearance of the iris following trauma. In neither case was there a rupture of the globe. In the first case the disappearance, which followed a dynamite explosion, was partial, while in the second case, after a violent contusion of the globe, there was complete disappearance of the iris and lens. The author speculates upon the manner in which this phenomenon may arise and gives a summary of the literature.

Edward P. Burch.

Merkulov, K. I. Ocular changes in cranial injuries. *Viestnik Opht.*, 1938, v. 12, pt. 4, p. 485.

In 52 injuries, the most frequent symptom of neurovisual involvement was a unilateral optic atrophy. Its direct cause is an injury in the region of the optic canal with subsequent strangulation of the nerve and hemorrhages into its membranes. Injury to the chiasm is rare and usually takes the form of lacerations. In all of the cases of traumatic optic atrophy fractures of the skull were found anteriorly, particularly in the frontal region. Lesions of the fundus were associated with injury to the bony structure of the face. The author believes a post-traumatic optic atrophy is diagnostic of a fracture of the skull.

Ray K. Daily.

Mikhailova, M. H. Penetration of six eyelashes into the anterior chamber. *Viestnik Opht.*, 1938, v. 13, pt. 4, p. 548.

In this unusual injury there was a small almost indistinguishable scleral perforation.

Ray K. Daily.

Mitzkevich, L. D. The penetration of eyelashes into the anterior chamber. *Viestnik Opht.*, 1938, v. 13, pt. 5, p. 694.

A report of a case, under observation for eight months, in which the presence of an eyelash in the anterior chamber produced no inflammatory symptoms.

Ray K. Daily.

Onfray, R., and Pirot, G. Concerning localization of intraocular foreign bodies and their extraction. *Bull. Soc. d'Opht. de Paris*, 1938, no. 2, Feb., p. 58.

A case is reported in which a magnetic foreign body was localized at the ora serrata. Attention is directed to the harm that may be done by using too strong a magnet, and so wounding the

structures as greatly as at the time of penetration. The advantage of a posterior route of removal is discussed.

Harmon Brunner.

Roche and Farnarier. Prolonged tolerance of a large, unrecognized, intraocular fragment of copper. *Bull. Soc. d'Ophth. de Paris*, 1937, Dec., p. 739.

An atrophying globe which had recently become painful was removed and a piece of copper weighing 0.13 gm. was found. Ten years earlier the eye had been injured by a firearm explosion. No pain or sign of inflammation had been observed previously.

Harmon Brunner.

Sédan, Jean. Extraction of lens containing foreign body for 42 years. *Bull. Soc. d'Ophth. de Paris*, 1938, March, p. 153.

Authenticated record of man blinded 42 years previously by metallic foreign body complicated by iridocyclitis. The extracted lens showed no general lenticular siderosis. An iron fragment was in a small pocket whose walls showed siderosis. (21 references.)

Harmon Brunner.

Sédan, Jean. Partial cataract stationary for six years with foreign body "nailing" iris to lens. *Bull. Soc. d'Ophth. de Paris*, 1938, March, p. 160.

Case report of an eye tolerating a metallic foreign body, which had lacerated the iris and buried itself in the lens. The iris was plastered over the capsular wound. Partial cataract reduced vision to 0.7. The author reviews the literature and summarizes the usual influencing factors in similar cases: age and scleriosis of lens, peripheral site of entry, approximation of wound in capsule. Temporizing is advocated in such cases. (35 references.) Harmon Brunner.

Sverdlow, D. G., and Goldin, L. B. Fracture of the superior maxilla complicated by fracture of the left frontal region, injury to the right optic canal, and total blindness of the right eye. *Viestnik Opht.*, 1938, v. 12, pt. 4, p. 515.

A description of severe injury in a student who was run over by a car. Two days after the injury, when the patient regained consciousness, he complained of total blindness in the right eye, and one month later optic atrophy had developed in the fundus.

Ray K. Daily.

Thies, Oscar. Chemical burns of the eye. *Klin. M. f. Augenh.*, 1938, v. 101, Nov., p. 744.

Injuries of the cornea by bromacetone, war gas, acid vapors, and sulphuretted hydrogen are reported in which early transplantation of labial mucous membrane would have yielded better results. C. Zimmermann.

Veil, P., and Borsotti, I. Experimental study of the extraction of magnetic foreign bodies from the vitreous of the rabbit. *Arch. d'Ophth.*, etc., 1938, v. 2, Dec., p. 1077.

Magnetic pieces of a steel needle were introduced into the vitreous of rabbits, under aseptic conditions. The authors then attempted to remove the foreign bodies by the posterior route after an interval varying from two hours to fifteen days. They conclude that, while the rule of as rapid intervention after the injury as possible holds good, it does not give any operative prognosis. An early attempt at extraction may miscarry, while one performed later may succeed. Intraocular foreign bodies quickly entangle themselves in the ocular tissues. Extraction necessitates laborious maneuvers even in easy

cases. Small particles are more difficult to remove than larger older ones encapsulated in exudate. It is necessary to have a large and a small electromagnet. The latter facilitates removal of small particles which have first been freed by the large magnet.

Derrick Vail.

Yanes, T. R. Industrial eye accidents. *Rev. Cubana de Oto-Neuro-Oft.*, 1938, v. 7, May-June, pp. 57-78.

This is a comprehensive treatise on the management of industrial eye injuries, with tables to calculate the percentage loss of vision, visual field, and ocular motility, and a formula to determine the total percentage disability. A fee schedule for various ophthalmologic services is also given. The author concludes by outlining a number of tests to unmask malingering.

Edward P. Burch.

17

SYSTEMIC DISEASES AND PARASITES

Black, W. B. Ocular manifestations of allergy. *Surg. Gynecol. and Obstet.*, 1939, v. 68, Feb. 15, pp. 406-413.

The role played by allergy in the various ocular diseases is reviewed. Endocrine balance, metabolic and biochemical functions, vitamins, and heredity all play a part in the allergic patient's manifestations. T. E. Sanders.

Charlin, Carlos, Essential facial neuralgia. *Ann. d'Ocul.*, 1938, v. 175, Dec., pp. 894-901.

In fifty cases of essential facial neuralgia treated with tuberculin there were 35 good, 8 mediocre, 7 bad results over a period of one year. One case is described.

John M. McLean.

Goldberg, F. P. Herpes zoster ophthalmicus. *Viestnik Ophth.*, 1938, v. 12, pt. 4, p. 499.

A case involving the left eye developed three days after an acute infection of the throat. The ocular involvement began with an iritis. On the ninth day there appeared signs of keratitis. In the regressive stage of the keratitis two episcleritis nodules, adjacent to peripheral corneal infiltrations, developed at the limbus. There was reduced corneal sensitivity in the right eye.

Ray K. Daily.

Pautrier, L. M. Ocular lesions in Besnier-Boeck-Schaumann disease; syndrome of Heerfordt. *Bull. Soc. Franç. d'Ophth.*, 1938, v. 51, pp. 352-363.

The author notes the same microscopic picture in a number of conditions formerly thought to be distinct, but which he now considers to be related, and which he designates as a true reticulo-endotheliosis. These conditions are: (1) lupus pernio, first observed by Besnier; (2) multiple benign sarcoid, as described by Boeck; (3) benign lymphogranulomatosis, described by Schaumann, which involves the skin, lymph glands, lungs, bones and viscera, and is accompanied by diabetes insipidus; (4) the condition described under the name of "Heerfordt's syndrome," which consists of parotitis complicated by facial paralysis, iridocyclitis, and a skin eruption resembling sarcoid. The microscopic finding identical in all these conditions is an accumulation of epithelioid cells surrounded by round cells, without giant cells or tubercle bacilli.

Clarence W. Rainey.

Shiga, Hidetoshi. Histological study of the eyes of rabbits congenitally infected with syphilis. *Amer. Jour. Ophth.*, 1939, v. 22, Feb., pp. 119-129.

Toulant, P. **Ocular complications in malaria.** *Acta Ophth. Orientalia*, 1938, v. 1, Oct., p. 18.

Among the rare ocular affections due to malaria, dendritic keratitis accompanied by slight trigeminal neuralgia is most often encountered. The keratitis is due to affection of the ophthalmic nerve by the fever, for the plasmodium has never been found in the cornea. Other rare complications are: keratitis ulcerosa and punctata, chorioretinitis, paralysis of the ocular muscles, and transitory optic neuritis (distinguished by melanoid pigmentation on the disc).

R. Grunfeld.

Villiard, Bouniol, Vailfont, and Fuentis. **Twenty-two cases of ocular leprosy.** *Bull. Soc. d'Ophth. de Paris*, 1937, July, p. 348.

A colony of 32 lepers showed 22 with ocular lesions. The incidence of various lesions corresponds with the usual figures; with the exception of scleral lesions, which were few. Final results of intraocular surgery on these patients were invariably poor.

Harmon Brunner.

Werdenberg, E. **Principles of the knowledge and therapy of ocular tuberculosis.** *Klin. M. f. Augenh.*, 1938, v. 100, Nov., p. 641.

This is a short synopsis on ocular tuberculosis from the clinical standpoint, based on experience with about 1,500 tuberculous eye patients. The chief types of ocular tuberculosis, the clinical picture, diagnosis, primary intrathoracic source, general tuberculous disease, diagnosis, and therapy are discussed, with special emphasis on the beneficial effect of high altitude. The author has discarded tuberculin tests and tuberculin treatment on account

of the harm he has seen from all tuberculin preparations. C. Zimmermann.

Wilson, R. P. **Filariasis of the conjunctiva.** *Giza Mem. Ophth. Lab.*, 1937, 12th ann. rept., p. 49.

A male aged seventeen years complained of "something like a serpent moving about in his left eye," noted that day for the first-time. A 10 cm. by 0.5 mm. single filiform cylindrical nematode, possibly *F. bancrofti*, was found moving under the bulbar conjunctiva, apparently trying to cross the corneoscleral margin to the cornea. Before the worm could be removed, it had migrated from the temporal to the nasal side of the globe and back again to the temporal side, from which position it was removed. Lawrence G. Dunlap.

18

HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Brewster, H. F. **Causes of blindness in Louisiana.** *New Orleans Med. and Surg. Jour.*, 1938, v. 91, Oct., pp. 166-173.

The cause of blindness in seven hundred cases was determined, with syphilis causing 15.1 percent; glaucoma, 10.9 percent; congenital defects, 13.9 percent; and trauma, 4.9 percent. It was estimated that 73 percent of the cases were preventable, and factors of importance in conservation of vision are discussed.

T. E. Sanders.

Cosmettatos, G. F., and Charamis, J. S. **The fight against trachoma in Greece.** *Rev. Internat. du Trachome*, 1938, v. 15, Oct., p. 149.

The antitrachomatous organization in Greece is described.

J. Wesley McKinney.

Fonseca, Aureliano. Trachoma among the negroes in the state of São Paulo. *Rev. de Oft. de São Paulo*, 1938, v. 6, Oct.-Nov.-Dec., pp. 195-197.

A brief statistical summary confirms the frequent statement that trachoma is rare in this race. The proportion was approximately of one negro case to one hundred white cases. W. H. Crisp.

Greeff, R. What pictures of Albrecht von Graefe do we possess? 4. Graefe and Bowman. *Graefe's Arch.*, 1938, v. 139, pts. 4 and 5, pp. 587-590.

Two more portraits of Graefe are described and illustrated. One is that of a young man in his student days and the other a picture of Graefe standing with William Bowman.

H. D. Lamb.

Kreiker, A. Blaskovics, L. *Ophthalmologica* (formerly *Zeit. f. Augenh.*), 1938, v. 96, Nov., 9. 73.

An obituary.

Lijo Pavia, J. Trachoma at the school age in Buenos Aires. *Rev. Oto-Neuro. Oft.*, 1938, v. 13, Sept., p. 201.

Eye examination of the children attending the primary schools of Buenos Aires revealed that of 300,000 children, 14,781 suffered from ocular disease, and 135 of these were diagnosed as having trachoma. As might be expected, the highest incidence of trachoma was in the more densely populated parts of the city. The methods employed to check the spread of trachoma are given.

Edward P. Burch.

Luckiesh, M., and Moss, F. K. Contrast sensitivity as a criterion of visual efficiency at low brightness-levels. *Amer. Jour. Ophth.*, 1939, v. 22, March, pp. 274-276.

Masters, Robert. Causes of blindness among the children at the Indian State School for the Blind. *Jour. Indiana State Med. Assoc.*, 1938, v. 31, Oct. 1, p. 537.

One hundred and eighty-seven students at the Indiana State School for the Blind are classified according to causes of blindness. Special comment is made concerning cases blind from causes usually considered preventable. These include ophthalmia neonatorum, 15 percent; prenatal syphilis, 12.3 percent; uveitis and its sequelae, 7 percent; and sympathetic ophthalmia, 3 cases.

George A. Filmer.

Musialova, Jadwiga. The problem of blindness in Poland. *Klinika Oczna*, 1938, v. 16, pt. 5, p. 631.

A review of the history of organized care of the blind and a detailed report of the various activities in this field in Poland. The institutions listed are asylums for the blind, schools for the blind, educational and vocational normal schools for the training of teachers, schools for the weak-sighted, and organizations for care of the adult blind and blind soldiers.

Ray K. Daily.

Onfray, Lanet, and Bonhomme. The Davidson test to measure stereopsis. *Bull. Soc. d'Ophth. de Paris*, 1937, July, p. 385.

Further studies on the Davidson test for stereopsis measurement (*Amer. Jour. Ophth.*, 1935, v. 18, p. 356.)

Tests on army officers and clinic patients showed a 40-percent difference. The authors advise these simple tests for automobile drivers as well as aviators. (4 references.)

Harmon Brunner.

Skomoroch, Woldzimierz. The activities of the antitrachomatous dispensaries in Wilka-Glusza. *Klinika Oczna*, 1938, v. 16, pt. 5, p. 673.

An official and detailed report of the work in this district.

Ray K. Daily.

Turner, Harris. Pensions for the blind in Canada. *Outlook for the Blind*, 1938, v. 32, Dec., pp. 165-168.

A pension system for the blind was established in Canada during March, 1937. At present 3,959 receive pensions, about 38 percent of the total. The maximum pension is twenty dollars a month, with deductions if total income is over two hundred dollars. The definition of blindness is "having less than 10 percent vision."

T. E. Sanders.

19

ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

Plitas, P. S. The innervation of the motile structures of the eye. *Viestnik Opht.*, 1938, v. 13, pt. 5, p. 645.

The author stained the nerve network of the iris of rabbits in vitro, with a dilute solution of methylene blue. The behavior of the iris thus stained shows that its motions are accompanied by considerable alteration in form and position of the nerve fibers and their endings. The nerves running meridionally are twisted spirally in the dilated iris, and become elongated in the contracted iris. The stained nerves do not permit differentiation between motor, sensory, and sympathetic branches.

Ray K. Daily.

NEWS ITEMS

Edited by DR. H. ROMMEL HILDRETH
640 S. Kingshighway, Saint Louis

News items should reach the Editor by the twelfth of the month

DEATHS

Dr. William Gray Ricker, Saint Johnsbury, Vermont, died February 28, 1939, aged 62 years.

Dr. Harry Stearns Willard, Patterson, New Jersey, died December 11, 1938, aged 62 years.

Dr. Walter Hamilton Snyder, Toledo, Ohio, died December 27, 1938, aged 68 years.

MISCELLANEOUS

The staff of the Institute of Ophthalmology of the Columbia-Presbyterian Medical Center of New York City will sponsor a memorial volume of The Collected Papers of Dr. John M. Wheeler, the majority dealing with ophthalmic and plastic surgery. This book will be published in June. Anyone desiring to reserve one or more copies at the cost price of \$4.00 per copy (postage prepaid) should send a check to the Library Committee, Institute of Ophthalmology, 635 West 165th Street, New York City.

The International Association for Prevention of Blindness, which maintains a secretariat in Paris, held its annual meeting in London on Wednesday, April 19, 1939. The principal topic for discussion was "The application of the Credé method for prevention of blindness in various countries." In the United States there has been a 75-percent reduction, during the past 30 years, in the number of cases of blindness from ophthalmia neonatorum. How this was accomplished was related at the international meeting by Dr. Conrad Berens of New York City, a member of the board of directors of the National Society for the Prevention of Blindness. America was represented also by Dr. Harry S. Gradle of Chicago, vice-president of the Illinois Society for the Prevention of Blindness, and Dr. Park Lewis of Buffalo, vice-president of both the International Association and the American National Society.

The American Foundation for the Blind is disseminating as widely as possible information regarding the Talking Book for the blind. This, as its name implies, is a phonographic disc which reads aloud any book which has been read into it. An average book can be recorded on 12 or 15 12-inch discs. One disc will read for approximately 30 minutes. Because of its particular construction for long-playing, the Talking Book cannot be used on an ordinary phonographic machine, but requires the Talking Book machine which was especially designed for it. The several models include machines with and

without radios, electric and springdriven. Seven models are now available, and may be obtained from the American Foundation for the Blind, 15 West Sixteenth Street, New York City, which manufactures and sells them to blind people at cost. Prices range from \$25.00 for a springdriven model to \$120.00 for a console radio-phonograph combination. Price lists giving full information on all models will be sent on request. As many blind people are financially unable to buy these machines, a special grant has been made by the Federal Government for the manufacture of a large number of these instruments to be loaned to such blind people. Information regarding the borrowing of these may be obtained from the American Foundation for the Blind. The Talking Book records may be borrowed by blind people from the 27 regional distributing libraries throughout the country. Among the many Talking Books now available are such titles as "The lost horizon" by James Hilton; "Man of property" by John Galsworthy; "Man the unknown" by Alexis Carrel; "Madame Curie" by Eve Curie; "Snow White"; "Rumbin galleries" by Booth Tarkington; "Journey's end" by R. C. Sherriff; "Sweden, the middle way" by Marquis W. Childs.

Increased activities of the movement for protection of eyesight are reviewed by the National Society for the Prevention of Blindness in its annual report made public recently by Eleanor Brown Merrill, Executive Director. Explaining that its slogan, "Sight for tomorrow—for the world of tomorrow" was selected to conform with the theme of the New York World's Fair, the report adds: "This year, with the lure of things to see in abundance at the Golden Gate International Exposition in San Francisco and at the New York World's Fair, we are forcefully reminded how essential the sense of sight is to enjoyment as well as to work. It would be interesting to conjecture how many, of the thousands traveling eastward and westward, owe their blessing of sight today to those who thought of the world of tomorrow and the saving of sight for that world. The Society's first step, as a local committee in 1908, was an effort to ensure sight for tomorrow by preventing blindness at birth from the disease known as 'babies' sore eyes.' During the past 30 years, the campaign to eradicate this disease—ophthalmia neonatorum—has brought about a 75 percent reduction in the number of

infants who lose their sight at birth. This was accomplished because an organized program was carried on to save sight for tomorrow." The need to intensify the campaign against "babies' sore eyes" is pointed out by the National Society for the Prevention of Blindness. A slight increase in the incidence of ophthalmia neonatorum has been noted recently among boys and girls entering schools and classes for the blind. The latest figure shows an incidence of 7.4 percent as compared to the previous figure of 6.7 percent. Most states now have laws making it compulsory for doctors and midwives to use a prophylactic solution in the eyes of infants at birth as a precaution against this disease.

"The great strides which have been made recently in the campaign for the control of syphilis," the report says, "are of particular significance to the movement for protection of eyesight. Although it is a little early to note the effects of the campaign against syphilis, in so far as sight is concerned, ophthalmologists in one state visited by a representative of the Society commented that fewer cases of syphilitic eye involvements are coming to their attention. It is to be hoped that such reports will become increasingly frequent." Approximately 15 percent of all blindness can be traced to syphilis.

According to the report, sight-saving classes are now providing a normal education for approximately 8,000 American school children who have such seriously defective vision that they cannot be taught in the regular grades. The number of sight-saving classes has grown to 589, an increase of 31 over the year before. Because of the continuous need for specially trained teachers, the Society will participate in the giving of courses for the preparation of sight-saving-class teachers and supervisors at the 1939 summer sessions of the following institutions: Western Reserve University, Cleveland, Ohio; State Teachers College, Buffalo, New York; State Teachers College, Milwaukee, Wisconsin; University of California, Los Angeles, California; Wayne University, Detroit, Michigan.

Approximately 450,000 copies of the Society's pamphlets and 12,000 posters were distributed. A motion picture film, "Preventing blindness and saving sight," was shown to 1,500 audiences. Exhibit material was provided for 125 conventions, fairs, meetings, and so on. A transcribed radio program concerning the dangers to the eyesight of children from the use of fireworks on the Fourth of July was used by 200 stations.

The Society's income for 1938 was \$126,000 and its expenditures amounted to \$169,000, necessitating the use of \$43,000 from its reserve fund. Financial support is received through voluntary contributions from 17,000 members and donors in all parts of the country.

SOCIETIES

The Association for Research in Ophthalmology, Inc., will hold its Tenth Scientific Meeting at the Coronado Hotel, Saint Louis, Missouri, on Tuesday, May 16, 1939. The following program will be presented:

1. Experimental ocular hypersensitivity, by T. E. Sanders, M.D., Department of Ophthalmology, Washington University, Saint Louis.

2. Studies on surface epithelium invasion of the anterior segment of the eye, by T. L. Terry, M.D., J. F. Chisholm, M.D., and A. L. Schonberg, M.D., Massachusetts Eye and Ear Infirmary, Boston.

3. A study of methemoglobin-producing organisms in ocular inflammations, by Maynard A. Wood, M.D., Department of Ophthalmology, University of Iowa, Iowa City.

4. The relation of Müller's orbital muscle to the pathology of retrobulbar tissues obtained in experimentally produced exophthalmos, by George K. Smelser, Ph.D., Department of Ophthalmology, Columbia University, New York.

5. Ocular reactions of horses and rabbits infected with strains of *Brucella* recovered from horses with periodic ophthalmia, by E. L. Burky, M.D., Robert Redvers Thompson, Ph.D., and Helen D. Zepp, A.B., The Johns Hopkins Hospital, Baltimore.

6. Staphylococcus conjunctivitis—experimental reproduction with staphylococci, by James H. Allen, M.D., Department of Ophthalmology, University of Iowa, Iowa City.

7. An immunological study of trachoma, by Louis Julianelle, Ph.D., Department of Ophthalmology, Washington University, Saint Louis.

8. Vitamin-D complex in myopia; etiology, pathology, and treatment, by Arthur A. Knapp, M.D., New York.

The Philadelphia County Medical Society Eye Section presented the following program on April 6, 1939: Posterior ethmoiditis with orbital involvement, by Dr. George W. Mackenzie; Compound prisms resolved and prescribed coincident to cylinder axes, by Dr. Sidney L. Olsho; Sketches on the early history of ametropia, by Dr. Burton Chance; Use of astigmatic dials, by Dr. John Matthews; Ophthalmic aspects of neuro-psychiatry as encountered in a state hospital service, by Dr. Samuel A. Zertsky.

The general assembly of the International Association for Prevention of Blindness was held in London, on Wednesday, April 19, 1939, at the House of the Royal Society of Medicine, 1 Wimpole Street, during the Congress of the Ophthalmological Society of the United Kingdom. The opening address was by Dr. P. Baillart, chairman of the International Association for Prevention of Blindness. The discussion

of the Credé method for the prevention of ophthalmia neonatorum in various countries was opened by Dr. A. H. H. Sinclair (Edinburgh), and continued by Dr. R. P. Wilson (Egypt), Professor F. Terrien (France), Professor von Szily (Germany), Professor L. Maggiore (Italy), Dr. Conrad Berens (United States), and Professor Dr. A. Vasquez Berriére (Uruguay). A film on preventive measures against industrial eye injuries was shown. The printed reports will be distributed to the members of the Association and forwarded on request.

The annual congress of the Ophthalmological Society of Egypt took place at the Memorial Ophthalmic Laboratory, Giza, on March 24, 1939. The symposium for the congress was "Nonsuppurative keratitis."

PERSONALS

Dr. John Dunnington and Dr. Phillips Thygeson have recently been appointed joint professors of ophthalmology of the Institute of Ophthalmology of the Presbyterian Hospital, New York; Dr. Dunnington as chief of the clinical branches of ophthalmology, and Dr. Thygeson as chief of research and teaching.

Dr. Louis Bothman announces the removal of his office from Peoples Gas Building, 122 South Michigan to Suite 1246—310 South Michigan Building. Practice limited to the eye.

Dr. Julian B. Marks announces the opening of his offices in the Beverly Medical Building, 415 North Camden Drive, Beverly Hills, California. Practice limited to eye, ear, nose, and throat.

Kalt, addressing the Société d'Ophthalmologie de Paris, at the recent celebration of its fiftieth anniversary, mentioned the fact that he was the only survivor of the founders of the Society.

Dr. H. L. Cunningham of Cape Girardeau, Missouri, was honored on April 10th at a dinner in celebration of his 50 years in the practice of medicine. Dr. F. E. Woodruff of Saint Louis was the guest speaker.

Dr. Everet H. Wood has opened his office at 120 Genesee Street, Auburn, New York, for the practice of ophthalmology. Dr. Wood has completed his residency training at the Long Island College Hospital. He had also held an appointment as clinical assistant at the Brooklyn Eye and Ear Hospital for 18 months. He also spent 1½ years as Fellow at the Long Island College of Medicine.

During the period of March 22d to March 25th, Drs. P. Chalmers Jameson and John N. Evans conducted intensive instruction courses in ophthalmology under the auspices of the Joint Committee on Graduate Education which includes the Medical Society of the County of Kings, Long Island College Hospital, and the Brooklyn Eye and Ear Hospital. Dr. Jameson's course covered operative technique of the extraocular muscles; Dr. Evans's, advanced instruction in visual field work. Both these courses were well attended, and it is probable that they will be repeated at a later date.

Dr. Walter Moore was recently made a surgeon at the Brooklyn Eye and Ear Hospital, to occupy the position previously held by Dr. James Andrew, who died a few months ago.

Dr. Charles Rosenthal has recently been appointed clinical assistant under Dr. Evans at the Brooklyn Eye and Ear Hospital.

The Brooklyn chapter of the American College of Surgeons visited the Department of Surgery at the University of Rochester, New York, on March 11th. This group included a unit composed of the following ophthalmologists: Drs. Walter Moore, Charles A. Hargitt, P. Chalmers Jameson, William F. Steinbugler, and John N. Evans.

Dr. Jonas Friedenwald presented a paper before the Pediatric Section of the Medical Society of the County of Kings in Brooklyn on February 15th. His subject was "The vitamin problem in the domain of ophthalmology."

Drs. Charles R. Hopkins and Harold Schilback have recently been appointed to a special committee for the New York Board of Education to investigate the general problem of sight-conservation classes as they now exist in schools.

GUMMA OF THE ORBIT*

MAX FINE, M.D.

San Francisco

Of all the conditions in which the ophthalmologist must make a differential diagnosis the most difficult is that of unilateral exophthalmos. Excluding the acute phlegmons of the orbit, cavernous-sinus thrombosis, and arteriovenous aneurysm, in which the diagnoses are usually obvious, every ophthalmologist has been confronted with the patient who has a slowly progressive exophthalmos in which the diagnosis has been most obscure, sometimes made only through the natural history of the disease, and sometimes not made at all. One of the conditions producing such exophthalmos, which because of its rarity is unfortunately often not considered till late, is gumma of the orbit.

CASE REPORTS

Case 1. A negress, aged 37 years, presented herself on March 16, 1937, complaining of pain and impairment of vision in the left eye of two weeks' duration.

The patient stated that she had first noted intermittent diplopia about one month previously. At that time she had begun to experience an aching pain in the left eye, radiating to the left frontal area. One week after the onset the diplopia disappeared and she noticed that the vision in the left eye was poor. She consulted an optometrist, who prescribed lenses. The pain became more severe and continuous, keeping her awake at night. The vision continued to decrease, and upon returning to the optometrist the pa-

tient was advised that she needed a stronger lens. At this time she observed that the eye protruded slightly and the lid drooped, and came to the Stanford Eye Clinic for advice.

In December, 1930, the patient had had an ischiorectal abscess, associated with extensive rectal strictures. The blood Wassermann had been four plus; the patient, however, denied any symptoms of primary or secondary lues. Continuous antiluetic therapy was given through 1931, consisting of neosalvarsan, mercury, and bismuth injections. She had received no treatment since that time. A blood Wassermann test taken in December, 1936, had been strongly positive, but the patient had failed to return for further treatment.

Ocular Examination: Vision in the right eye was 15/15, there was no evident pathology and the visual field was normal. In the left eye there was no light perception. A moderate ptosis was present, the lid margin covering the upper half of the pupil. The globe protruded slightly, directly forward. The exophthalmometer reading for the right eye was 18.5 mm.; for the left eye, 20.5 mm.

Except for slight upward rotation, less than five degrees, the left eye was immobile (fig. 1A). The little finger could be inserted between the orbital margin and the globe in all meridians to the equator without encountering abnormal resistance. The pupil was semidilated, slightly irregular, and failed to react to direct light. A prompt consensual reaction was ob-

* From the Department of Ophthalmology, Stanford University School of Medicine.

tained and a prompt reaction to convergence. Corneal sensitivity was normal. The optic disc was slightly pale in the temporal half and the markings of the lamina cribrosa were more prominent than

The ocular rotations were normal except for a slight weakness of the inferior rectus (fig. 1, B). The exophthalmos had receded completely. Light perception was present and there was a good pupillary

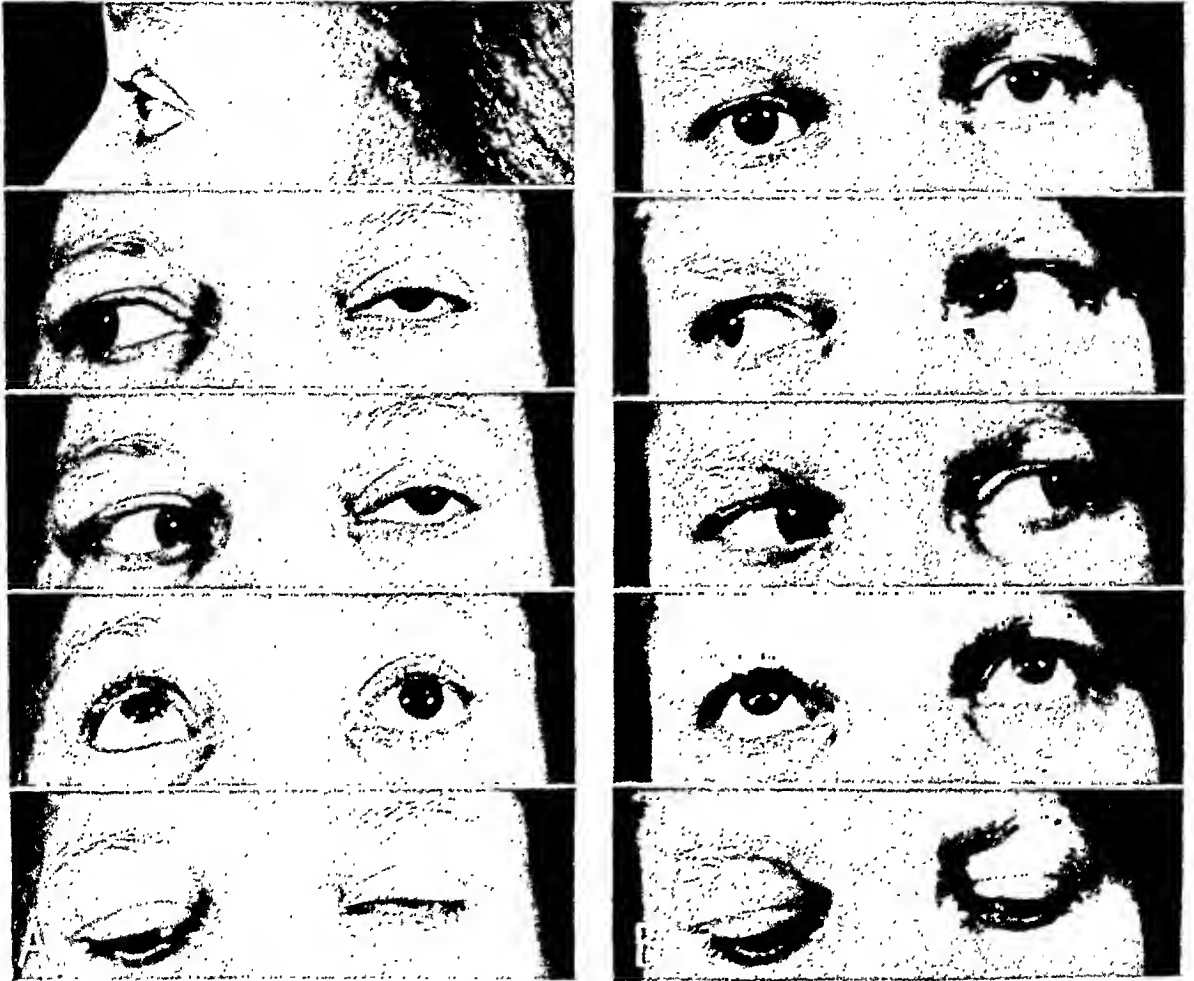


Fig. 1 (Fine). Case 1. A, as of March 17, 1937; B, as of May 8, 1937.

in the right eye. Sensation over the distribution of the supraorbital nerve was normal.

Upon general examination, no clinical evidence of lues was found. Laboratory examinations were negative as to the spinal fluid and urine. An X-ray study of the orbit showed no pathology.

Impression: Gumma of the left orbit.

Treatment: The patient was given injections of iodo-bismutol twice weekly and potassium iodide 40 grains daily. On April 23, 1937, a very slight ptosis remained.

reaction. The pallor of the disc had increased somewhat.

On May 21, 1937, the patient was able to count fingers at about one foot in the nasal field. There was no central nor temporal vision. Ocular rotations were entirely normal. The disc had become very pale. The blood Wassermann was now negative. Bismuth and potassium iodide were discontinued, and a course of neoarsphenamine was begun.

Case 2. A Negress, a domestic, aged 27 years, divorced, presented herself on De-

cember 10, 1937, complaining of a swelling over the right eye of two months' duration and severe headache for the past two weeks.

The patient stated that about two months previously she had noticed a small nontender nodule at the upper margin of the orbit. This nodule had slowly increased in size to the present time. In the past two weeks the swelling had been somewhat tender and during this time

of the upper lid, but the pupil remained uncovered. The upper lid showed diffuse, nonpitting edema with slight erythema. A smooth, rounded nodule, about 1 cm. in diameter, of rubbery consistency, slightly tender, was attached to the middle portion of the supraorbital ridge. The nodule was only slightly movable. Its lower margin could not be accurately outlined because of the surrounding edema—it appeared to continue under the margin

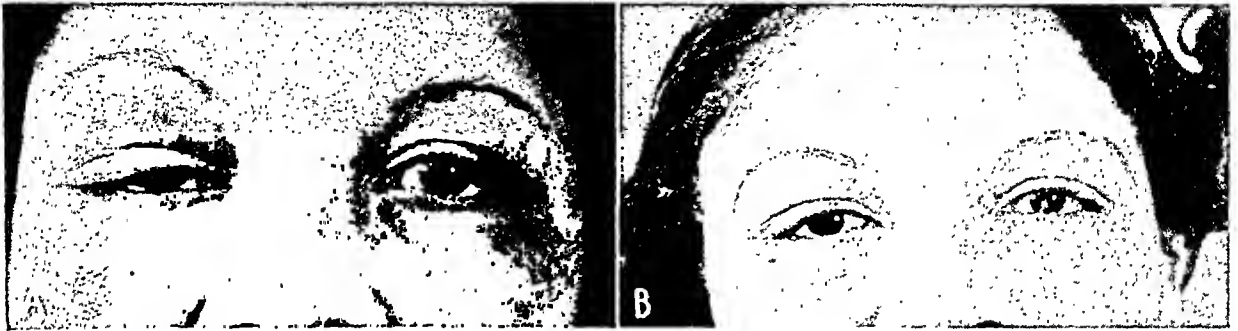


Fig. 2 (Fine). Cast 2. A, as of December 13, 1937; B, as of January 27, 1938.

also she had experienced severe frontal and parietal headaches, which had become increasingly worse and were most severe during the night. At times the pain seemed to arise in the right orbit and radiate upward. During the past month she had had a chronic running nose, as from a head cold, and had noticed that the senses of smell and taste seemed diminished. One week previously, while blowing the nose, she had discharged a small piece of bone "like crab shell" from the right nostril. She had felt well generally and there had been no loss of weight. There had been no impairment of vision.

The patient denied any history of luetic symptoms or anti-luetic treatment, by name and description. No blood test had been taken prior to the present illness.

Ocular Examination: Vision in the right eye was 15/40; corrected to 15/15 each eye.

Right eye: There was a moderate ptosis

of the ridge into the orbit for a short distance. There was slight edema and redness of the lower lid (fig. 2, A). Sensory discrimination over the distribution of the supraorbital nerve was normal. The conjunctiva of the lids was slightly hyperemic. The cornea was clear; its sensitivity normal. Iris and pupil showed normal reaction to light and convergence, with normal consensual reaction. The tension (digital examination) was normal. Ophthalmoscopic examination of the fundus showed no abnormalities of the disc, retina, or vessels. The extraocular muscles allowed normal rotations in all directions. The visual fields were normal—3/330 white and 2/330 red and green.

Physical examination: No abnormalities were found except in the nose. The right septum was convex in its mid portion with an ulcerated granular mass touching the middle turbinate. The left side presented a similar appearance. A probe introduced in this area passed

through the septum, there being a perforation at the junction of the cartilage and the vomer.

Laboratory examination: An X-ray film of the orbit revealed no pathology. The blood Wassermann reaction was four plus.

Impressions: Gummatous periostitis of supraorbital ridge; gumma of nasal septum with perforation.

Treatment: Antiluetic treatment was begun in the syphilis clinic on December 16, 1937, with prescription of sobisminol (oral bismuth) 1.2 gm. daily. On December 27, 1937, there was a definite decrease in the size of the tumor. The patient stated that she had regained the sense of smell. There was no evidence of bismuth toxicity. On January 6, 1938, a very marked decrease in the size of the gumma had taken place. A small, nontender nodule the size of a hazelnut could now be felt, attached to the under surface of the superior orbital margin (fig. 2, B). The patient had been free from headaches or pain for two weeks.

January 27, 1938, the blood Wassermann test was repeated: four plus.

By February 10, 1938, there had been complete involution of the gumma. Only a slight residual thickening of the orbital margin remained. Examination on February 24, 1938, showed no difference between the right and left orbits.

DISCUSSION

The two cases of gumma of the orbit reported herewith are the only two on record in the Stanford Clinic since 1913, in which year the present system of records was begun. During this period approximately 40,000 patients were seen in the eye department and 271,000 in all departments. Kemp¹ reported that of 6,000 cases of syphilis at the Johns Hopkins Hospital only five cases of orbital syphilis occurred, and stated that he had collected

150 cases of syphilis of the orbit from the literature. Birch-Hirschfeld,² at the Leipzig clinic, found that syphilis of the orbit constituted .01 percent of ocular disease. All of these statistics indicate that the condition is very rare. The author, reviewing the available literature of the past 25 years, found 24 reported cases in which the diagnosis of orbital syphilis was established. The numerous cases of orbital pseudotumor in which the Wassermann reaction was negative and in which there was no history or clinical evidence of syphilis have not been considered in this review, although undoubtedly a number of these that vanished under administration of potassium iodide must have been gummas. For brevity these cases are presented in tabular form.

It is interesting to note that of the 24 recorded cases, 5 were bilateral, although the onset was not simultaneous in the two orbits. It is probable that this apparently high incidence of bilateral occurrence of orbital gumma may be explained by the fact that many unilateral cases are not reported, while the unusual feature of bilaterality is reported more constantly. It is possible, however, that an organotropic mechanism may be concerned, witness the relative frequency of bilateral luetic uveitis.

Diagnosis. The common symptoms and signs that lead to a diagnosis of orbital gumma are pain, exophthalmos, and impairment of function of one or more of the nerves within the orbit; namely, the optic nerve, oculomotor, trochlearis, abducens, and the ophthalmic and maxillary divisions of the trigeminal. The extent of this involvement depends on the situation, size, and duration of the lesion. The instances of orbital gumma may be divided into two anatomical groups—those that occupy the apex of the orbit and those that involve the marginal portion of the orbit, including the lacrimal fossa. The two cases reported here are prototypes

of these two groups. Obviously the marginal lesions will produce no exophthalmos nor nerve palsies. Pain, however, is a common symptom and may be very severe, radiating to the frontal region and to the eyeball. This symptom is frequently the first and may precede other signs and

symptoms by weeks or even months. Severe orbital pain or frontal headache are described as the initial symptoms in eight of the recorded cases. Increased intensity of the pain at night appears to be characteristic. The neoplasms of the orbit are, as a rule, painless, and the symptom of

TABLE 1
RECORDED DATA ON CASES OF GUMMA OF THE ORBIT FOUND IN THE LITERATURE

No.	Author	Age	Sex	Proptosis	Motility	Vision	Fundus and Fields
1	Williamson-Noble ⁶	25	M	Marked	Limited 3 wks. after onset	6/12	
2	Hine ⁷	69	M	Appeared 2 mos. after onset		H.M.	Choked disc
3	Taylor ⁸	30	F	{ R. Marked L. Appeared after removal of R.E.	Limited		
4	Nelissen and Weve ⁹	49	F	Marked	Immobile; ptosis	Reduced	Field constricted
5	Dodd ¹⁰	31	F	Moderate	Partial paresis III	12/200	
6	Kalt ⁵	35	M	{ R. Marked; forward L. Forward and downward	Immobile; ptosis Immobile	1/10 1/50	Hyperemia of disc
7	Musial ¹¹	49	M	{ R. Moderate L. Marked	Limitation of upward rotation Immobile; lagophthalmos	10/10 Blind	Papilledema
8	Kurz ¹²	65	F	3 mm.	Normal		Disc pale, field constricted
9		3		Present 1 year	Total paresis III		
10	LeWin and White ¹³	42	M	Present	Limitation of upward rotation	6/60	Retinal edema
11	Paunel ¹⁴	38	M				
12	Seefelder ¹⁵	52	F	Present		6/6	Choked disc
13	Orieckhin ¹⁶	39	M	Present	Limited upward and downward	8/10	
14	Werner ¹⁷	50	F	{ R. L.			
15	Cantonnet and DeSaint Martin ¹⁸	34	M	Rapidly progressive forward and down	Slight external rotation only	9/10	
16	Kemp ¹	34	M	Marked	Immobile; ptosis	20/40	Normal
17		34	M	Present	Paresis superior rectus	20/100	Retinal veins full
18		45	M	Present	Limitation in all directions; ptosis	Light perception	Choked disc
19		30	M	4 mm.	Paresis right external rectus	20/20	Veins congested
20	Desiderio ¹⁹	39	M	Slight	Limited in all directions; convergent strabismus	Fingers at 3 in.	
21	Löhlein ²⁰	51	M	7 mm.	Moderate limitation in all directions		
22	Raffin ⁴	29	F		Ptosis; divergent strabismus	5/5	Normal
23		28	F				
24	Pascheff ²¹	43	F	{ R. Forward and upward L. Slightly forward	Marked limitation except upward	H.M. 6/20	Optic nerve atrophic Optic neuritis

TABLE I (Continued)
RECORDED DATA ON CASES OF GUMMA OF THE ORBIT FOUND IN THE LITERATURE

Other Signs and Symptoms	Blood Wass.	Treatment	Histologic Examination. Course.
	Neg.	Mercury and KI for 5 wks. Exenteration of Orbit KI. No improvement in 2 mos. Exenteration	Gumma, moulded against sclera and surrounding the optic nerve Chronic inflammatory mass with marked changes in blood vessels "suggesting syphilitic origin" "Organizing gumma"
Severe headache. X-ray shadow in antrum Draining supraorbital sinus	Pos.	Mercury and KI without improvement. Exenteration Mercury and KI to point of dysentery Antiluetic	Complete recovery Improvement 2 wks. After 2 mos. only partial oculomotor paresis remained Gumma of orbital margin. Complete recovery in 6 wks.
Ulceration of cornea. Severe keratitis and iritis	Neg.	Frontal sinus operation. KI and mercury rubs when Wassermann found + Antiluetic therapy 2 mos. Bilateral biopsy. Antiluetic therapy resumed more intensively	Bilateral gumma. Complete disappearance of proptosis and ptosis after 3 mos. Slight residual limitation of movements. Vision R.E. 2/10, L.E. 1/10
Swelling of lids 1½ yrs. Keratitis	Neg.	Biopsy	Gumma
Tenderness lower orbital margin. Severe headache Congenital lues	Sp. Fl. + Pos.	Antiluetic	Complete recovery
X-ray shadow in orbit	Pos.	Antiluetic	Immediate improvement. Pupil remained dilated and fixed Immediate recovery. Vision 6/6. Slight pallor of disc
2 periorbital nodular masses	Pos. Neg.	Antiluetic Ethmoid operation with no result. Mercury rubs .3 G. Salvarsan	Rapid disappearance of tumors Complete recovery in 6 wks.
Swelling of lids			Complete recovery in 1 wk. "Recidiv reaction" after 2 mos. Followed by complete recovery with 40 injections mercury, and KI Inflammatory cells with marked endarteritis and periarteritis; gumma. Symmetrical tumor occurred L.E. 8 mos.
Small node lower temporal margin of orbit	Pos.	Clinical diagnosis of fibrosarcoma. Excision	Complete disappearance of tumor 1 mo.
Symmetrical tumor X-ray of orbit neg.	Pos.	4 injections Salvarsan Mercury cyanide .01 G. daily	Exophthalmos began to recede in 17 days. Complete recovery in 6 wks.
Aching rt. forehead. Pupillary reactions poor. Anesthesia supraorbital nerve	Neg.	KI Grains 120 daily. Arsphenamin weekly	Return of function external rectus 2 days after first injection. Complete recovery except slight residual exophthalmos in 1 mo. Vision 20/20
Pain, numbness in forehead 1 mo. Anesthesia supraorbital nerve	Pos.	One dose arsphenamin. Pt. did not return	After single injection all symptoms improved. 23 mos. later slight exophthalmos, normal motility and vision. No disturbance of V. nerve
Pain in face. Left pupil fixed. Gumma of pharynx	Pos.	3 injections arsphenamine. Pt. did not return for 8 yrs.	Reduction exophthalmos after 3 injections. 8 yrs. later: no exophthalmos, normal motility, secondary optic atrophy.
Pain in orbit 2 yrs. before relieved by mercury rubs Severe frontal and orbital pain; corneal and supraorbital anesthesia Severe orbital pain and frontal headache. History of early lues Severe pain in head and ear. Small swelling above L.E. Maculopapular rash Gummatous periostitis of lacrimal fossa. Luetic lesion in nose Thickening of lower orbital margin, extending into orbit as a hard mass	Pos. Neg. Pos.	Neoarsphenamin. Mercury rubs daily Antiluetic Antiluetic	After one mo. exophthalmos 1.5 mm., slight esophoria. Eye entirely normal 8 mos. later Complete recovery Complete recovery in 3 wks. Complete recovery in 1 mo.
		Antiluetic	Complete recovery
	Pos.	Neoarsphenamin. Mercury rubs, KI. Biopsy	"Necrotic zone surrounded by zone of lymphocytes, fibroblasts, plasma cells and giant cells. Perivascular infiltration with thickening of vessel walls: syphiloma." Complete recovery of position and motility. Complete recovery in 2 mos.
4 mos. later a symmetrical tumor of L.E. appeared		Biopsy	

pain may serve as a valuable differential sign (Igersheimer²). When the lesion is situated near the rim of the orbit there is usually some tenderness to pressure, though not very marked. The pain of an intraorbital gumma may be increased when pressure is made on the globe.

Exophthalmos is a constant sign of intraorbital gumma. The superior wall of the orbit is the most common site of origin and the resulting displacement of the globe is usually directly forward or forward and downward. The exophthalmos is not reducible by pressure; this may

serve as a differential sign in ruling out proptosis due to angiomas of the orbit or orbital edema associated with infections of the regional paranasal sinuses. Pressure of the gumma on the veins may produce congestion of the orbit and contribute to the exophthalmos. Kemp has described dilation of the veins of the temple in association with such a lesion. X-ray examination of the orbit is usually of little diagnostic aid, the findings usually being negative. Raffin⁴ describes two types of orbital syphilis: (1) an exudative hyperplastic periostitis with thickening of the periosteum; (2) a gummatous periostitis with a circumscribed tumor of soft consistency. The latter type, occurring in the tertiary stage, is the more common and this fact probably explains the absence of positive X-ray findings.

Involvement of the extraocular muscles through pressure paralysis of the motor nerves occurs in practically every case of intraorbital gumma. This involvement progressed to complete immobilization in one third of the collected cases. Paresis of the external rectus is the most common onset of the immobilization. Ptosis and superior-rectus paralyzes are next in frequency.

The optic nerve may be affected in several ways. Most often there is papilledema followed by secondary atrophy. Occasionally, there is optic atrophy without signs of congestion. Kemp mentions retrobulbar neuritis followed by atrophy as occurring frequently, but a review of the reported cases does not bear this out. In our second patient there was complete blindness with only a slight pallor of the disc. This was followed by optic atrophy of the primary type.

Paresthesias of forehead and cheek may occur from irritation of the first and second branches of the trigeminus. Depending on whether the nerve involvement is in the irritative or destructive

stage, there may be hyperesthesia or hypesthesia. Keratitis neuroparalytica has been reported rather infrequently, complete anesthesia of the cornea being uncommon.

The Wassermann reaction is important in the diagnosis of gumma of the orbit, and, indeed, in most cases the diagnosis rests on the presence of one or more of the signs described above and a positive Wassermann reaction. It is, however, to be kept in mind that in 6 of the 26 collected cases (22 percent) the blood Wassermann was negative. In one of these the spinal fluid was positive.

Treatment. As with gummas elsewhere, there is probably no disease in which the results of treatment are as gratifying as in gumma of the orbit, provided it is instituted before the nerve changes have become irreversible. Recovery usually comes within three to six weeks irrespective of the type of antiluetic therapy used. The combination of potassium iodide with one of the heavy metals (mercury or bismuth) as in other late luetic processes, affords a safe and effective antiluetic therapy.

It must be remembered that the response to antiluetic therapy is not always immediate. In several of the cases reported no decrease in exophthalmos was noted until three weeks had elapsed. Where a therapeutic trial is being made, in the presence of a negative Wassermann reaction, therapy should not be abandoned for at least one month. In the case reported by Kalt,⁵ antiluetic therapy was given for two months without improvement. When biopsy proved the lesion to be a gumma more intensive therapy was instituted, with good recovery. When potassium iodide is used the dosage should be adequate (40 to 100 grains daily). The minute doses which are often prescribed only serve to confuse the diagnosis.

In any case of suspected orbital tumor in which the diagnosis is not apparent, a therapeutic trial of antiluetic therapy is indicated, regardless of the Wassermann reaction. This rule, stated by Meller 25 years ago, has been made no less applicable today by the advances in syphilology and ophthalmology.

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LECTURES ON MOTOR ANOMALIES*

X. SUPRANUCLEAR PARALYSES

A. BIELSCHOWSKY, M.D.

Hanover, New Hampshire

The disorders of the movements of the eyes caused by lesions of peripheral origin—namely, of the nuclei and the individual motor nerves—have been discussed previously. If a lesion is situated above the nuclei, injuring the supranuclear apparatus—that is, the pathways between the nuclei and the cortical, the sub-cortical, or the vestibular centers—paralysis of associated muscle groups of both eyes occurs as a rule. The few exceptions to this rule are the paralyses caused by a lesion of the posterior longitudinal bundle or those in the immediate neighborhood of the nuclei of the oculomotor nerves. Such a lesion can deprive one internal rectus muscle of the faculty of adduction in lateral movements, leaving intact its convergence function, or it can make the elevator muscles of one eye incapable of producing a voluntary elevation without disturbing the involuntary elevation that takes place in Bell's phenomenon. Theoretically, supranuclear paralyses of the other individual ocular muscles are quite conceivable, but there is no way of differentiating between supranuclear and peripheral disturbances of those muscles, because they do not act as parts of different mechanisms in anything like the same degree as the internal rectus muscles act in lateral and in convergence movements, or as the elevators act in obeying the elevation impulse and the impulse to shut the eyes. Therefore, but for the few exceptions just mentioned, the diagnosis

of a supranuclear lesion is based chiefly on bilateral and equal paralysis of associated muscle groups.

I shall discuss, first, associated paralysis of the parallel lateral movements, the symptoms of which have been studied mostly in paralyses caused by lesions of the associated pathways either within or near the pons and the region of the fourth ventricle. In an uncomplicated case of this type, both eyes being unable to move to the right, for instance, are deviated slightly to the left. This deviation induces the patient to turn his head a little to the right in order to look at an object straight in front of him. No diplopia is present because of the equality of the deviation of the two eyes. When the patient is ordered to look at an object on the right, neither eye can move beyond the midline; or if the movement is not completely lost, the restriction of the movement is equal in both eyes, so that binocular single vision is not disturbed. In such a case jerky nystagmus to the right reveals the repeated futile efforts to direct the eyes toward the object in the right periphery of the field of fixation. Strict proof of the supranuclear origin of such a paralysis is given by the intact convergence function of the left internal rectus muscle, which is unable to advert the left eye only when a parallel movement is called for, whereas its reaction to convergence impulses is normal. From this behavior it must be concluded that the nerve to the left internal rectus and its nucleus, as well as the pathway descending to the latter from the convergence center, are intact, but that the pathway descending from the cortical center governing the associated

*From the Dartmouth Eye Institute, Dartmouth Medical School. Read before the Seventh Annual Mid-Winter Clinical Course of the Research Study Club, Los Angeles, California, January, 1938.

movement to the right has been interrupted. However, it is still to be ascertained whether the paralysis of the right external rectus muscle is also caused by a supranuclear lesion. It is quite possible that a lesion of the right abducens nucleus involves the posterior longitudinal bundle as well, so that the left internal rectus fails to function when innervated together with the right external rectus. The deci-

acter of the ocular movement that had just been produced. In a second test, while the patient was fixating an object straight in front of her I rotated her head *slowly* to the right. Again the eyes moved to the left as far as in the first test, but this time they were able to maintain fixation and to remain directed to the left as long as the head was kept rotated to the right, a proof that this time the ocular



Fig. 50 (Bielschowsky). Associated paralysis of levoversion caused by an acute encephalitis pontis. A, the two eyes do not respond to the maximal levoversion impulse while (B) dextroversion, as well as (C) convergence are executed perfectly. By turning the patient's head with a sudden jerk to the right (D), levoversion to an almost normal extent can be obtained, but the eyes move back toward the original position immediately after the rotation of the head is completed. (When the photograph reproduced in D was taken, the two eyes were already moving back from the extreme levoversion toward the middle position.)

sion will depend on how the right abducens nerve responds to a vestibular stimulation.

In 1901, I¹ had under observation a patient with an acute encephalitis that was localized in the pons, and had produced an associated paralysis of the parallel movement to the left, with no disturbance of the convergence function of the internal muscles (fig. 50). The patient was unable to move her eyes to the left at command, and was also unable to look at an object situated in the left half of her visual field. In the face of the apparently complete inability to move the eyes to the left, the result of the further examination was all the more surprising. While the patient was fixating an object straight in front of her I rotated her head with a sudden jerk to the right. The result was that both eyes moved to the left to a nearly normal extent, but immediately after the rotation of the head had been completed the eyes went slowly and involuntarily back to their original position—a proof of the genuine reflex char-

movement was caused not by a vestibular reflex action but by an innervation of cortical origin. The same effect was obtained when, instead of rotating the patient's head, the object looked at was carried very slowly to the left. Both eyes maintained fixation and followed the object as far as in the other tests and remained directed to the left for a considerable time. The ocular movement to the left produced in such a manner I called "Führungsbewegung"; Duane calls it the "following movement." It arises from the same cortical innervation as the ocular movement in the second test. I shall try to explain later how the different results arise that are obtained by making use of the tests described.

By far the most frequent of the associated paralyses of the vertical movements are the paralyses of elevation, next in frequency are the paralyses of both elevation and depression, and the rarest are the paralyses of the depression movement. In 1906 Steinert and I² reported on a series of cases of paralysis of the associ-

ated vertical movements, the characteristic signs and symptoms of which are shown in the following case report:

A man, aged 48 years, had paralysis of the elevator and depressor muscles following a paralytic stroke. He was unable to look either up or down at command and was likewise unable to fixate an object in his visual field above or below the horizontal plane. When he sat opposite a vision test card so that the largest letter was on a level with the horizontal plane of his eyes, he could read the largest letter but was unable to read the letters in the next line below. That this was not due to a deficiency of vision was easily proved. If the card was raised gradually the patient could read each of the lower lines as soon as it came up to the horizontal plane, thus showing that he had normal visual acuity. But after he had read the lowest line he was unable to read the larger letters, because they were at that time situated above the horizontal plane.

The same result was obtained if, instead of raising the test card, prisms of increasing strength were placed base down before the patient's eyes. He was then able to read the lower lines. When the prisms were placed base up they helped him to read the letters above the horizontal plane. But when a card with the largest letters on top was brought to the horizontal plane, a prism of 10 degrees placed, base up, before each eye made the letters illegible; similarly, if the prisms were placed base down before his eyes, the letters on the lowest line became illegible. In other words, the patient was unable to compensate for a prismatic displacement of even 5 arc degrees by a corresponding vertical ocular movement. In striking contrast to this result was the ability of the patient's eyes to follow an object to an almost normal extent when it was moved *slowly* up and down and to remain in the elevated or depressed posi-

tion for a considerable time. But they were unable to return to the horizontal plane from either position without being led by the guiding object.

Another interesting experiment was as follows: The patient sat opposite a vertical tangent scale, the fixed light in the center being on a level with his eyes. At the word of command he was unable to direct the visual lines at one jump to one of the more distant numbers—for instance, to the number 5 above or below the light—whereas he succeeded in turning his eyes gradually and with a noticeable effort from the light to the number 1, from 1 to 2, and so on up to the upper or down to the lower end of the scale. It was not a normal movement, but a slow creeping of the eyes along the successive numbers above or below the light. A quick vertical movement of the patient's eyes up or down to their normal limits could be produced only when his head was turned passively up or down with a sudden jerk. In Germany this behavior is called "Puppenkopffphänomen" (doll's head phenomenon). But, as in paralysis of the lateral movements, immediately after the cessation of the passive rotation of the head, the eyes glided back automatically to the original middle position.

Finally, Bell's phenomenon was looked for. When the patient was asked to shut his eyes they went upward to the normal extent.

In some cases Bell's phenomenon is the only proof of the integrity of the nuclei in bilateral paralysis of the elevator muscles (fig. 51).

What is the significance of the various results obtained through examination of the associated paralyses by means of the methods just described? They make it possible not only to decide that a paralysis has been caused by a supranuclear lesion, but also, at least to a certain extent, to localize the lesion more precisely, since it

can be determined which of the various pathways descending to the nuclei are intact and which have been injured.

Barany's tests for ascertaining vestibular excitations present an essential improvement in the examination of the patients with associated paralyses. They can be used for bedridden or somnolent patients and, further, since the vestibular stimulus continues for about a minute, its effect can be observed much better

water at 20°C. is syringed into the right auditory passage; from 10 to 20 seconds later labyrinthine nystagmus toward the opposite side arises if the vestibular apparatus is intact. If the patient is unconscious there will be no nystagmus but only a slow movement of labyrinthine origin toward the same side; that is, in the example chosen it will be toward the right, even if there is an associated paralysis of dextroversion of supranu-



Fig. 51 (Bielschowsky). Associated paralysis of the elevator muscles caused by a tumor of the corpora quadrigemina. A, in the usual position of the eye, both visual lines are equally depressed. B, the visual lines can be raised voluntarily or at a word of command only to the horizontal plane. C, they cannot pass even if the fixed object is slowly moved upward. D, only in Bell's phenomenon, if the patient is asked to close his eyes, is a maximum elevation obtained, proof of the supranuclear localization of the lesion. E, the eyes have regained the faculty of moving upward after removal of the tumor.

than in the head-rotation test, which produces only a momentary excitation. Without going into the details of the various Barany tests, I wish merely to give the following data. The patient sits on a revolving stool that is rotated about 10 times. The vestibular stimulation that results from the current thus set up in the endolymph of the semicircular canals produces a labyrinthine (jerky) nystagmus toward the side of the rotation; a sudden discontinuance of the rotation brings about a secondary nystagmus in the opposite direction, lasting from 30 to 40 seconds, provided the vestibular apparatus and its connections with the nuclei of the paralyzed muscle are intact. If the patient is bedridden, somnolent, or a young child, the caloric test is preferable. After it has been ascertained by examination that the ear is normal, as it must be,

clear origin. If, however, the right eye lags behind, it must be inferred that the nucleus of the abducens nerve or the nerve itself is injured.

As long as the paralyzed muscles respond to vestibular stimulation it may be assumed that there is integrity of the nerves, their nuclei and the pathways connecting them with the vestibular apparatus. In many instances, although a patient with this type of paralysis is unable to turn his eyes in the direction of an object or sound, either at word of command or spontaneously, he can do so if an object which he is asked to fixate will be moved in that direction. How this "following movement" is released and where the innervation concerned arises, is still an unsolved problem. Since there are several centers in the cerebral cortex—in the frontal, in the occipital, and in the

temporal lobe—that are concerned with the associated movements, some authors supposed that the innervations causing the “following movement” and the willed or commanded movement are derived from different centers and pathways, so that a lesion which interrupts the pathway descending from the frontal lobe makes the voluntary movement disappear while the following movement may not be disturbed. However, many patients, although they are able to follow a moving object, lack the ability to make an “attraction movement”; that is, to turn the eyes toward an outlying object the image of which, situated in the periphery of the retina, attracts their attention.

Both kinds of movement belong to the so-called psycho-optic reflexes because, being produced by visual stimuli, they are performed more or less instinctively, so that one is justified in locating the origin of these movements in the occipital lobes. In spite of the fact that only the attraction movement can be lost while the following movement remains more or less intact, it is not necessary, in my opinion, to assume that they have separate centers and pathways. The patient, whose case was cited as an example of associated paralysis of vertical movements, was unable to overcome a prism of 10^Δ , base down or up, by elevation or depression of the visual lines, nor was he able to turn his eyes from the fixated point to an object, the image of which was situated 5 degrees above or below the retinal centers. But he accomplished vertical movements of 10 arc degrees and more when he was given prisms of gradually increasing strength, beginning with 1 or 2^Δ , or when he was induced to turn his eyes to an object which was situated near the fixed point, either above or below it, and from that object to another nearby, so that the eyes performed a sort of climbing along a vertical series of objects that were close together.

This behavior strongly suggests a comparison with fusion movements which are independent of the will. From testing the vertical duction power, for instance, it is known that one is unable, in the beginning, to overcome a prism of 5^Δ or more. But by beginning with a prism of 1^Δ or 2^Δ and gradually increasing the strength of the prism one can overcome from 8^Δ to 10^Δ by the appropriate vertical divergence. Such a fusion movement as well as the following movements in cases of associated paralysis may be explained in the same way. The nearer the image which attracts attention is situated to the fovea, the stronger is the motor effect that is produced. If a weak prism is placed, base out, before one eye, adduction takes place involuntarily, whereas a strong prism in the same position does not, as a rule, produce that movement. If the pathway descending from the occipital center is injured but not fully interrupted, the patient may be unable to perform an attraction movement of great extent, but he is able to make a small movement induced by the excitation of a paracentral retinal point. When the fixated object is moved slowly or the strength of the prism is increased little by little so that the retinal image of the fixated object moves from the fovea to a place in its proximate vicinity, a new small compensating movement results which becomes considerable in extent. This theory of mine must still be proved, but it takes into consideration all the clinical signs and symptoms, especially the fact that the following movement can be produced by moving the object across the field of fixation very slowly, or by turning the patient's head very gradually in the opposite direction. Unlike the sharp jerking of the head, such slow rotation causes no vestibular reflex movement.

According to the particulars which can be ascertained by the various methods of investigation, it may be possible to make

an approximate localization of the lesion causing the associated paralysis in an individual case. "Pseudo-ophthalmoplegia," so-called by Wernicke since he saw it as a partial manifestation of pseudobulbar paralysis, displays the following characteristics: The patient is unable to move his eyes at word of command, but moves them involuntarily in states of emotion or if he is interested in an object or in a sensory excitation originating from an object. The following movements can be produced provided the patient's attention is attracted to the moving object. The reflex movements of vestibular origin are undisturbed. In some of these cases the whole oculomotor apparatus, including the cortical centers, is uninjured, the lesion being "transcortical," injuring the connections between the frontal oculomotor centers and other parts of the cortex. Similar symptoms occur in diseases of the extrapyramidal system.

More frequently one encounters a second group of associated paralyses, characterized by the patient's inability not only to move the eyes in a certain direction either voluntarily or at word of command, but also to move them toward an object attracting his attention. The following movement and the reflex movements of the eyes can, however, be produced. In this group the lesion is to be localized below the cortex; probably the pathways descending from the frontal centers are injured not far above the nuclear region.

In a third group the paralyzed associated muscles react only to reflex (vestibular) stimulation; neither the voluntary and attraction movements nor the following movement can be produced. In cases of paralysis of the lateral movements the internal rectus muscles are able to perform the convergence movement; in cases of paralysis of the vertical movement the elevator muscles may be able to function

in Bell's phenomenon. In such cases the lesion must be localized closely above the nuclei, the posterior longitudinal bundle being intact.

In a fourth group the paralyzed muscles do not respond to visual or other sensory stimuli, or to word of command, nor are they able to perform a following movement or, lastly, a reflex (vestibular) movement. In such cases either the posterior longitudinal bundle or the nuclei themselves must have been injured. The latter supposition is untenable in cases of paralysis of the lateral movements if the internal rectus muscles are able to produce a convergence movement and in cases of paralysis of the vertical movements, if Bell's phenomenon is undisturbed.

In the last group of associated paralyses there are not only symptoms of a supranuclear lesion, but also signs and symptoms indicating an injury of the nuclei, such as paralytic squint and diplopia and a variation in the behavior of the paralyzed muscles according to the mode of stimulation.

The cases of associated ocular paralysis caused by lesions within the cerebral hemispheres are usually unsuitable for precise investigation, partly because of the bad mental condition of the patients and partly because of the quick recovery of ocular movements if the patient does not die. It may be supposed that in some cases an examination would reveal almost the same symptoms as in cases of pseudobulbar paralysis, which have already been discussed as the first group of associated ocular paralyses.

CONJUGATE DEVIATION

Conjugate deviation, which is found in most cases of a recent cerebral lesion, may be caused by a variety of circumstances. If an associated pair of muscles is paralyzed in consequence of a lesion

of the cortical center or of the path descending from it, the antagonistic pair of muscles ceases to receive its inhibitory innervation at the same time, because the excitatory and the inhibitory impulses to the agonists and antagonists, respectively, are derived from the same center and from the same pathway, so that a lesion of one not only causes paralysis of the agonists but also prevents relaxation of the antagonists. Besides the loss of inhibitory impulses, a stimulation of the antagonists may be caused by a lesion that extends to the other hemisphere. The different causes of conjugate deviation make it easy to understand that in cases of cortical lesions the deviation, as a rule, is greater than in cases of supranuclear paralysis of pontine origin and that it sometimes disappears within a few hours—as soon as the patient regains consciousness. Even if the conjugate deviation is essentially paralytic, it usually disappears rather quickly, probably because there are centers in both hemispheres for the parallel movement to the right and left, so that

the center of the sound side soon begins to function vicariously. In the examples under discussion the patient's head is turned in the same direction as his eyes—that is to say, to the side of the lesion—except in those cases of hemiplegia which are characterized by contracture of the limbs. In these cases the eyes and the head are turned toward the affected extremities.

The accompanying table offers a comparison of the paralyzes of lateral movements caused by pontine lesions and those caused by lesions in the hemispheres.

PARALYSES OF CONVERGENCE

Since it is known that the internal rectus muscles can be deprived of the ability to coöperate with the external rectus muscles in lateral movements without interference with their convergence function, it seems obvious at first glance that the latter function can also be lost without prejudice to the former. It is not known where the convergence center is located. In view of the fact that convergence

Lesions of the Hemispheres

1. Deviation in the first stage, regular and of considerable magnitude.
2. Deviation usually of short duration.
3. Deviation toward the side of the lesion.
4. Deviation frequently a symptom of stimulation.
5. Head turned (as a regular symptom) in the same direction as the deviation of the eyes.
6. Associated paralysis of the muscles for contralateral movement, usually slight and transient.
7. Invariably symmetrical functional disturbance of the associated muscles.
8. Paralysis of the extremities and of the facial nerve collateral with the associated eye-muscle paralysis.
9. In lesions of both hemispheres all eye movements (including the vertical) restricted or impossible.

Pontine Lesions

1. Deviation relatively rare and, as a rule, of small magnitude.
2. Deviation, if present, permanent.
3. Deviation toward the opposite side.
4. Deviation usually a paralytic symptom, only rarely a stimulation symptom.
5. Abnormal position of the head not a typical symptom; if present, the head usually turned in the opposite direction to the deviation of the eyes.
6. Associated paralysis in the direction of the lesion, nearly always severe and permanent.
7. Frequently asymmetrical paralysis of the associated muscles in consequence of the extension of the supranuclear lesion to the nucleus or the nuclei.
8. Paralysis of the extremities, if present, opposite to the side of the eye-muscle paralysis; paralysis of the facial nerve, if present, usually collateral with the eye-muscle paralysis.
9. In pontine lesions of both sides, paralysis of side-to-side movements without disturbance of the vertical movements.

paralyses are frequently caused by lesions within the region of the corpora quadrigemina, it is presumed that a subcortical convergence center is located in that region; the isolated lesion of this center or of the pathway descending to the nuclei of both internal rectus muscles must produce the symptoms of a pure convergence paralysis. In such a case the patient's eyes are unable to converge, whereas the internal rectus muscles function normally when coöperating with the external rectus muscles in parallel movements. There is crossed diplopia of near objects, whereas objects at a distance of more than one meter are seen single provided the convergence paralysis is not complicated by an exophoria. Even a slight degree of exophoria causes insuperable crossed diplopia of distant objects if the convergence is abolished completely. The angle of deviation is the same when the patient looks straight forward or to either side, but it is increased not only when he looks at near objects but, as a rule, also when he looks up, and is decreased when he looks down, for the anatomic reasons mentioned previously. Variations of the signs and symptoms occur according to whether there is complete paralysis or only more or less weakness of the convergence function.

The convergence paralyses of organic origin are rare. Many of the cases published are no doubt instances of functional disturbances that are not always easy to distinguish from true organic paralyses. This difficulty is based on the exceptional position of the convergence among the ocular movements. Convergence does indeed belong to the fusion movements, but it is the only one that can also be performed voluntarily. If binocular single vision is lost or has never existed, as in cases of strabismus acquired in early childhood, the ability to converge is more or less diminished or is absent, thus prov-

ing that the fusion tendency is the most essential factor in producing convergence, whereas the voluntary impulse to look at a near point is of secondary importance in bringing convergence into play. In spite of equally good vision in either eye, convergence is frequently defective or absent, especially in myopic persons who do close work without glasses. Since they see distinctly at their *punctum remotum* they avoid the fusion effort which is not assisted by the accommodation impulse, and learn to suppress the retinal images of the nonfixating eye.

Lastly, an insufficiency of convergence as a true functional neurosis is encountered rather frequently not only in anemic and delicate persons or in patients convalescing after exhausting illnesses, but also as a symptom of general neurasthenia or hysteria. Conditions of this type are sometimes diagnosed wrongly as convergence paralysis because convergence cannot be produced by means of the usual methods. No convergence is obtained if the patient is ordered to fixate a near object, for instance, his own finger, or the fissure of Landolt's ophthalmodynamometer. But these tests do not offer reliable proof of the presence of a convergence paralysis unless it is ascertained that the patient has really been given the required impulse to look at the near object. This can be determined by observing his accommodation and pupils during the tests. Only if the pupils contract and the refraction increases according to the distance of the near object can one be certain that the deficiency of convergence is due to an organic lesion. I remember a patient who complained of a permanent crossed diplopia in near work after an accident. She was said to be an invalid after several oculists had submitted a diagnosis of convergence paralysis of traumatic origin. When her eyes were tested in the usual manner there was no

convergence. Since there was no accommodation and the pupils did not react in the tests I tried to ascertain whether the absence of cortical impulses was voluntary or involuntary. I asked the patient to tell me to which number the minute hand of my watch was pointing. She promptly produced the corresponding convergence, accommodation, and pupillary action. I have seen several similar cases in which the patient at first seemed unable to converge but could be induced to do so when he was tested with objects which attracted his attention and interest.

Another method suitable for deciding whether the lack of convergence is due to an organic lesion or is functional is the examination of the adduction power by means of prisms. In the case of convergence paralysis of organic origin crossed diplopia will arise as soon as a prism, base out, is held before one eye. In the case of functional deficiency of convergence binocular single vision will remain, and the eye behind the rotary prism will move in accordance with the increasing strength of the prism until the limit of the adduction range is passed.

To make sure that the lack of convergence is a true paralysis of organic origin, the following conditions must be fulfilled: 1. There must be definite symptoms of an organic intracranial disease. 2. The convergence paralysis must have occurred rather suddenly. 3. The signs and symptoms tested at various times and by various methods must, in a certain measure, be constant. 4. The accommodation and the convergence reaction of the pupils must be producible without the corresponding convergence.

If internal ophthalmoplegia is accompanied by convergence paralysis, a lesion of the nuclear region and possibly also of the supranuclear pathway descending from the convergence center is certain.

DIVERGENCE PARALYSIS

Oculists are still at variance concerning divergence paralysis. Parinaud (1883) was the first to describe the signs and symptoms of divergence paralysis, and many authors have since confirmed his observations. Others, especially Berry and Alfred Graefe, have opposed the diagnosis, maintaining that the syndrome of so-called divergence paralysis should be explained in a different way.

The manifestations of a typical case of divergence paralysis include the following:

1. Homonymous diplopia, due to an abnormal convergence position, arises rather suddenly. It occurs for all objects beyond a certain distance, mostly beyond 10 to 20 inches.

2. The angle of squint being small or moderate, does not increase when the patient looks to the right or left; it will either remain the same as in the primary position of the eyes, or it will even decrease. It increases or, on the other hand, decreases when looking down or up, according to the normal anatomic conditions mentioned previously. This explains the habitual anomalous position of the head in some cases. The chin is depressed against the chest, so that by elevation of the visual lines convergence is transformed into parallelism, as has been demonstrated by photographs made of a similar case and discussed in the second paper in this series (fig. 9, p. 135, October, 1938).

3. When an object is brought nearer to the patient, the two images approach each other and are finally fused when the object is at a distance of from 10 to 15 inches. At this distance binocular single vision is maintained when looking to the right as well as to the left.

4. When the object is brought still nearer, insufficient convergence causes crossed diplopia.

5. Appropriate prisms, base out, give the patient binocular single vision, even of distant objects, in the whole field of fixation.

6. A restriction of the field of fixation is not found.

7. In repeated examinations at different times the angle of squint is found to be relatively constant.

From a theoretical point of view, the possibility of the occurrence of divergence paralysis must be conceded. On the other hand, I am convinced that in many cases a diagnosis of divergence paralysis is wrongly made. I have observed many patients with paralysis of one or both abducens nerves in whom typical symptoms were present at first, but the characteristic symptoms were gradually lost and a concomitant type of deviation developed so that it no longer increased, or, on the other hand, decreased when looking to the right and left. Sometimes this transformation may even occur within a few days. If such a paralysis is seen only in the later atypical stage, it is difficult to distinguish it from a divergence paralysis.

I have also observed patients with symptoms apparently typical of this kind of paralysis, caused by a slight convergence spasm. I remember one patient with a homonymous diplopia that had arisen four months previously. According to the report of his physician, intervals without diplopia alternated with periods during which the original diplopia was observed. The patient was extremely irritable and had been dismissed from military service on account of epileptic fits. In the first examination I found an abnormal convergence of 6 degrees when the patient's eyes were directed to a distant object. This decreased slightly when he looked to the left or to the right or up, increasing only when he looked down. When the object was brought closer, to a

distance of 15 inches, binocular single vision was obtained in the whole field of fixation, whereas crossed diplopia arose for nearer objects. Prisms of 5^A placed, base out, before each eye gave binocular single vision also for distant objects. All these symptoms coincided completely with those of typical divergence paralysis. Only repeated examinations brought discrepancies to light. When the patient opened his eyes after he had closed them for a fraction of a minute, crossed diplopia corresponding to a divergence of 2 degrees occurred, but only for a few seconds. Then the two images approached one another, fused and separated again, this time, however, as homonymous images, as the result of the gradual increase—up to 6 degrees—of convergence. Such behavior is just as difficult to reconcile with divergence paralysis as is the fact that the patient, who primarily required a prism of 5^A, base out, before each eye to obtain binocular single vision, was able to maintain it even when the strength of the prisms was diminished. He was able to maintain it even when the prism had an abducting effect, so that a divergence of 1 arc degree was produced. This, however, lasted only for a few seconds, after which his eyes went back to the usual convergent position. Thus the true nature of the case was disclosed. It was not, as had been previously diagnosed, a case of divergence paralysis but one of slight convergence spasm occasionally met with in highly neurotic persons such as our patient. Objection could be made to the diagnosis of convergence spasm since the patient displayed convergence insufficiency at reading distance, whereas in a case of spasm one would expect an increase of convergence. But it is by no means unusual to find inability to transform convergence into parallelism in combination with a weakness of the convergence innervation—a peculiarity

seen especially in neurasthenia, an important characteristic of which is the combination of increased irritability and abnormal exhaustibility.

A third anomaly might perhaps be mistaken for a divergence paralysis. If the fusion faculty is destroyed by a physical or psychic shock, an esophoria which up to that time has been unnoticed may become manifest and display symptoms similar to those of a divergence paralysis. As a rule, however, a thorough examination of the range of duction will show absence not only of divergence but also of other fusion movements.

Although it must be admitted that the differential diagnosis in many cases is extremely difficult, sometimes even impossible, I am sure that divergence innervation exists and that I have seen instances of a true divergence paralysis which not only presented the typical manifestations of the anomaly but, and this is of decisive importance, also changed rather suddenly into an equally typical case of abducens-nerve paralysis. Such a development is proof of an organic lesion, localized at first near the intact abducens nucleus but later extending to and finally injuring the nucleus itself.

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TONOMETRY AND UNUSUAL CASES OF GLAUCOMA

EDWARD JACKSON, M.D.

Denver, Colorado

Our knowledge of glaucoma is still incomplete and based too much on the examination of eyes with absolute glaucoma that have been removed for pain. The tonometer, giving a mathematical statement of the hardness of the eyeball, is too much trusted as a final authority. A diagnosis should be like a court decision, based on a knowledge and right evaluation of all the facts bearing on the case. A first, provisional diagnosis may be considered as a hypothesis to help arrange the facts, so that apparently opposing facts may be compared and an estimate formed of their relative importance. But the final diagnosis should be based upon a consideration of all the facts. Often it must wait until the case has run its course; and, for some conditions, this is impossible. Not all the facts bearing upon the diagnosis are obtainable.

When a known laboratory procedure is carried over into clinical medicine, it may bias our judgment so as to disturb more than help diagnosis. When the ophthalmometer was applied to the clinical study of astigmatism, it was supposed to be an infallible guide that made cycloplegia unnecessary. Then a correction of 0.50 or 0.75 D. was found necessary for the prescribing of cylinders. Now it is known that the astigmatism of the crystalline lens changes with age, and the ophthalmometer is found to be of little practical value for the measurement of astigmatism after middle life.

Similar revisions of our estimates of values have been necessary for the Wassermann reaction, and for the various tuberculin tests. They must also be made for evidence given by the tonometer as to intraocular pressure and glaucoma. Our

understanding of glaucoma has been based on the examination of eyes destroyed by the disease. It needs to be corrected by histories of cases in which destruction of vision did not occur. Very few of these cases are found recorded in the literature. But they occur, and the reports of such cases would give us a better understanding of the real tendencies and results of glaucoma.

At the Pan-American Medical Congress, in his helpful remarks on glaucoma, Dr. Edward C. Ellett stated that we know glaucoma untreated, or inefficiently treated, goes on to blindness. The general opinion is that blindness is inevitable, unless a successful operation checks the progress of the disease. The following cases show that such may not be the result.

Case 1. C.D.L., aged 56 years, stood for many hours by her husband's death bed, exposed to severe cold, with the wind blowing on her right eye. That night she suffered terrible pain in the right eye and head; and after that she suffered from neuralgia, worse in the right eye. She was sent to me after three weeks, with the diagnosis of "grippe." The eye was hyperemic with slight pericorneal redness; the pupil ovoid, 5 mm. in diameter. The cornea was hazy, so that fundus details could not be seen; tension +2; vision, the ability to detect moving objects in the temporal field.

In the left eye the pupil was 3 mm. in size, the tension normal, the fundus normal, and vision 4/4. Operation on the right eye was urged, and eserine 1 to 2000 solution prescribed. Next day the pain was relieved, and did not return. In three weeks the cornea was clear, and the optic disc showed a slight cup, 1 diopter,

to the abrupt edge. In three months the patient had another attack, with pain, tension +2, and aching for two days. After more than a year she had continued free from any other attacks.

Case 2. Mrs. D.J. began wearing glasses at the age of 37 years, for near work only. At the age of 63 she needed for distance +3.50 D. sph., and for near +5.50 D. each, but did not wear glasses constantly. She now found the sight very poor in the left eye, 4/45 eccentric, and it felt full. There was pain around it. Pupils both were circular, 4 mm. in diameter. Tension was +1. After she had become very tired one day the eye became congested and very painful that night. Eserine 1 to 400 contracted the pupil and relieved the pain. But three days later it was extremely painful with tension of +3.

Posterior sclerectomy was done, 8 mm. back from the temporal limbus, and the anterior chamber became two thirds filled with blood. One week later pain returned, the pupil dilated to 5 mm. There was a bleb over the scleral incision. Tension was +2. These conditions continued over two weeks. Then iridectomy was done upward, and the pillars of the iris were drawn up into the subconjunctival space and caught in the angles of the scleral wound. This gave relief from pain, tension became -1, the eye comfortable. This condition continued to her death at the age of 75. The right eye continued normal, with vision of 1 +.

Priestley Smith defines glaucoma "as

an excess of pressure within the eye, plus the causes and consequences of that excess." But there are other conditions, some yet unknown, that are needed to make the dreaded disease glaucoma. We may have excess of pressure apart from glaucoma; and we may have characteristic changes of the eye, atrophy of the optic nerve, and blindness without discovering at any time an excess of intraocular pressure. So firmly fixed is the idea that increased intraocular pressure means glaucoma that serious errors are based on a tonometric reading. A few cases that have been followed up, for a number of years afterwards, show conclusively that high tension may be present for a time without any danger of glaucoma.

Case 3. Miss J.E., age 31 years, whose father had lost one eye from glaucoma, had worn glasses for aching of the eyes when at school. With the Gradle-Schiötz tonometer the intraocular pressure measured in each eye 35 mm. Hg. The fields of vision and the optic discs were normal. With correcting glasses vision was 4/3 partly in each eye. She was given pilocarpine, 1 percent solution, to use twice a day. This was discontinued within two years. At the age of 38 years her tension was 30 mm. in each eye, vision 1.2 in each, and the fundus was normal. Correcting glasses were given, and 1.25 D. sph. added for reading. She seems to have continued free from any indication of glaucoma.

Republic Building.

FREQUENCY OF BLINKING AS A CLINICAL CRITERION OF EASE OF SEEING

MATTHEW LUCKIESH, D.Sc., AND FRANK K. MOSS*
Cleveland

It is generally assumed that visibility¹ and ease of seeing are closely related and that objects of the highest visibility are seen with the least visual effort. The latter is here defined as a subjective experience of strain which accompanies voluntary action. Thus measurements of visibility are useful in appraising the effectiveness of various controllable aids to seeing. However, if an increase in visibility is accompanied by functional changes such as an alteration in the functioning of the mechanisms of accommodation and convergence, it cannot be assumed *a priori* that an enhancement of visibility results in a decrease in the effort of seeing. For example, it is readily demonstrable that the placing of a low-power concave lens before an emmetropic eye results in a higher degree of visibility for distance vision.² However, such an addition to the refractive systems of the eyes usually cannot be worn with comfort, particularly in the performance of near-vision tasks. Thus visibility, as a diagnostic criterion in ophthalmology, is not necessarily of primary importance from the viewpoint of ease of seeing, as is qualitatively well known. In general, it is the purpose of the present paper to discuss the periodic movements of the eyelids as a criterion of ease of seeing, and as a clinical method for appraising ocular comfort.

THEORETICAL CONSIDERATIONS

A consideration of the possible physiological causes of involuntary blinking leads rather directly to the theory that this activity of the eyelids is related to

the degree of "tension" or state of "fatigue" of the subject which exists at the time. It has also been observed that the frequency of blinking is remarkably constant for the individual under constant experimental conditions.³ Obviously, the latter characteristic suggests the possibility that the frequency of blinking may serve as a practical criterion of the visual effort expended in seeing under different experimental conditions. Thus it may be possible to determine the relative degree of ocular comfort afforded by different ophthalmic corrections worn by the patient while the latter performs a critical visual task such as reading.

In briefly reviewing some of the theories related to the phenomenon of blinking, the terse statement of Duke-Elder⁴ is perhaps the most enlightening: "The causation of the movements of blinking has excited little interest. It used to be tacitly accepted that it was a reflex initiated through the fifth nerve to keep the cornea moist and to wash it clear of foreign particles. This, however, is not the case although the movements are increased by peripheral irritation." More specifically, the researches of Ponder and Kennedy⁵ suggest that the normal and periodic movements of blinking are not necessarily dependent upon impulses in the second, third, fourth, fifth, or sixth cranial nerves, and that they are also not dependent on afferent impulses arising from retina, cornea, conjunctiva, or extrinsic muscles. Thus, these investigators conclude that the eyelid movements are not of a reflex character, in the ordinary sense of the word, since there appears to be no afferent path the destruction of which causes blinking to cease.

* From the Lighting Research Laboratory, General Electric Company.

However, Adler⁵ questions the validity of this conclusion on the basis that the functions of all of these nerves were not simultaneously excluded.

Ponder and Kennedy summarize their viewpoint by stating that "the rate of blinking is closely related to the mental tension of the subject at the time, and that in all probability the movements constitute a kind of relief mechanism, whereby nervous energy, otherwise unutilized, passes into a highly facilitated path." They further conclude that "all that is necessary to occasion a change in the rate of blinking is a change in the degree of attention* of the subject."

In general, these conclusions pertaining to the physiological significance of blinking are substantiated and extended empirically by a number of researches conducted by the authors.⁶ Our results also suggest that an increase in the so-called normal rate of blinking is due, at least in part, to factors associated with fatigue. According to Blount,⁷ one of the reasons for blinking is to allow alteration to take place in the tension of the ocular muscles and thus eliminate early fatigue. The investigations of Miles⁸ indicate that the movements of blinking are associated with an upward and inward movement of the cornea of 10 to 15 degrees which is accomplished in somewhat less time than is required for the complete lid movement. If the theory of Blount is correct, it follows that the movements of the eyeball on blinking are effective in minimizing the development of muscular fatigue as well as in protecting the cornea from distortion by the tightly fitting tarsal edges of the lids and in serving other important purposes.

Thus it appears that attention, effort, and fatigue are to be considered as factors which influence the frequency of the periodic movements of blinking. In fact, Litinsky⁹ has proposed the recording of blinking as a method of studying ocular fatigue in school children while reading. This possibility heretofore has not been studied extensively. In general, previous researches on blinking have been largely devoted to the study of conditioned reflexes rather than from the present viewpoint of a criterion for appraising the effectiveness of various aids to seeing.

EMPIRICAL CONSIDERATIONS

It is axiomatic that the degree of fatigue induced by the performance of work increases as the task is prolonged. Thus the frequency of blinking should increase as a critical visual task is prolonged, if blinking is associated with effort and fatigue. This assumption has been experimentally confirmed by the authors by observing the frequency of blinking during the first and last five-minute periods of an hour of continuous reading. In general, our experimental conditions involved the reading of interesting material under three different levels of illumination by a group of 11 adult subjects possessing normal or near-normal vision. The results are summarized in table 1.

It will be noted that the frequency of blinking is higher during the last five-minute period of reading than it is during the first periods under all illuminations. The same result was invariably obtained by each of the 11 subjects. The statistical data of table 1 also indicate that the alterations in the frequency of blinking are highly significant with respect to their corresponding probable errors. Furthermore, it will be noted that the rate of blinking during the last five-minute period decreases as the task of reading is made

* Attention (behavioral concept): An adjustment of the sensory apparatus which facilitates optimal excitation by a specific stimulus or complexity of stimuli, and which inhibits the action of all others.

TABLE 1

THE NUMBER OF BLINKS OCCURRING DURING THE FIRST AND LAST FIVE-MINUTE PERIODS OF AN HOUR OF READING. THE VALUES REPRESENT THE GEOMETRIC MEANS OF THE DATA OBTAINED FROM ELEVEN SUBJECTS.

	1 Foot-candle		10 Foot-candles		100 Foot-candles	
	First	Last	First	Last	First	Last
No. of blinks.....	35	60	35	46	36	39
Percent increase.....	71.5±5		31.4±3		8.3±1	

easier by higher levels of illumination.¹⁰ This is a highly significant fact, since it has been shown³ that mere photometric stimulation does not materially alter the normal frequency of blinking except for a few rapid blinks which may occur immediately after a sudden change in illumination or brightness. In fact, the so-called normal frequency of blinking is about the same in the dark as it is in the light, other conditions being constant. Thus it appears from these data that the frequency of blinking is definitely correlated with both the duration and the severity of the visual task. Similar results have been obtained under various experimental conditions which are known to be favorable or unfavorable for ease in seeing. Some of these results are briefly summarized in table 2.

The data of tables 1 and 2 show that an increase in the frequency of blinking

invariably occurs when the conditions for seeing are made more unfavorable. It will be obvious from these brief descriptions of the visual tasks that the more unfavorable conditions involve (a) the fatiguing effects of prolonged voluntary activity of the extrinsic muscles; (b) the distraction of a bright peripheral image during reading; (c) the fixation and recognition of very small details; (d) an unusual relationship between accommodation and convergence due to the red background of the reading matter; and (e) perceptual and fixational difficulties arising from closely spaced lines of print. Hence it follows that the rate of blinking is intimately related to various and complex psychophysiological factors involved in seeing, thus empirically confirming the conclusions of Ponder and Kennedy.³ Furthermore, it appears from these data that the frequency of

TABLE 2
DATA OBTAINED DURING EXPERIMENTAL PERIODS OF FIVE MINUTES EACH

Visual Situation	Relative Rates of Blinking	
a. Performing a task requiring rapid alternate fixation of test objects separated laterally by 30 degrees*	First 5 min.	100
	Second 5 min.	146
	Third 5 min.	171
b. Reading with and without glare. The glare-source was a bare 50-watt lamp placed 1 meter from the eyes and 20 degrees above the line of vision while reading*	Without glare	100
	With glare	156
c. Reading types of different sizes under 10 foot-candles*	12-point type	100
	6-point type	148
d. Reading 10-point type on white and fairly saturated red paper† (reference 11)	White paper	100
	Red paper	118
e. Reading 10-point type set solid and with 3 points of leading‡ (reference 12)	3-point leaded	100
	Solid-set	120

* Average of 18 subjects. † Average of 20 subjects. ‡ Average of 30 subjects.

blinking is an extremely sensitive criterion of ease of seeing, since rather large differences in frequency are obtained between visual conditions which are commonly encountered in practice. Therefore, we have used it as a criterion for appraising ocular strain and fatigue arising from

Considering the subjects as a group, it will be noted that the minimum frequency of blinking occurred with plano lenses in addition to the usual corrections, if any. Quantitatively, the frequency of blinking was increased about 42 percent by the addition of the convex spheres and

TABLE 3

THE FREQUENCY OF THE REFLEX BLINK AS A CRITERION FOR DETERMINING THE EFFICACY OF OPHTHALMIC CORRECTIONS PRESCRIBED ACCORDING TO THE USUAL TECHNIQUES. THESE DATA DENOTE THE NUMBER OF BLINKS OCCURRING DURING FIVE-MINUTE PERIODS OF READING WHILE WEARING CORRECTIONS OF $+0.50$ DIOPTER AND -0.50 DIOPTER, RESPECTIVELY, IN ADDITION TO THE CORRECTIONS USUALLY WORN.

Subject	Frequency of Blinking			Subject	Frequency of Blinking		
	+ .50	0	− .50		+ .50	0	− .50
1	38	27	40	16	60	36	48
2*	30	22	30	17	35	26	31
3*	77	64	83	18	25	14	19
4	28	17	21	19*	40	30	52
5	93	70	82	20*	28	27	37
6*	16	12	14	21*	17	13	20
7	17	12	12	22*	112	78	92
8	40	20	33	23*	49	36	40
9	38	28	46	24*	25	14	18
10	7	10	12	25	60	24	39
11*	18	10	16	26*	6	8	10
12*	30	24	30	27*	43	33	100
13*	9	6	9	28	16	5	12
14*	25	14	22	29	42	24	34
15*	33	25	25	30*	57	48	56
* Correction worn				Arithmetic mean			
				37.1	25.9	36.1	

of indicating the proper refraction, at least with respect to the spherical component, upon the basis of comfort in seeing.

An analysis of these data with respect to individual cases indicates errors in refraction in at least 5 of the 30 cases studied. Subjects 7, 10, 15, 20, and 26 are included in this group. Among the latter it will be noted that three of these subjects do not wear glasses. It will also be noted in these six cases that the indicated errors are on both the plus and minus sides of "perfect" correction. Our interpretation of these data, for a few typical cases, follows:

Subject 2. It is apparent that the glasses worn by this subject provide maximal comfort in view of the symmetrical relationship between the frequency of blinking and the additional spherical power.

Subject 27. The sharp rise in the frequency of blinking with the addition of 0.50 diopter of minus power indicates the seriousness of overcorrecting this subject with minus lenses. Obviously, a correlation of these results with muscle-balance findings would add to the significance of the former.

Subject 25. This case is the reverse of that of Subject 27 and indicates the ocular discomfort which would result from overcorrecting with plus lenses.

Subject 6. Since an addition of 0.50 diopter of either plus or minus power produces but little change in the frequency of blinking, a slight error in correcting this subject appears to be correspondingly less serious.

The simplicity and ease with which these data may be obtained and the significance of the criterion as a measure of ocular comfort suggests the possible usefulness of this method in clinical practice. For example, this criterion might

be of value in prescribing corrections in the following situations:

- (a) In cases involving a compromise between over and under corrections as these are associated with the accommodative-convergence relationship.
- (b) In cases involving significantly different findings by subjective and objective techniques of refraction.
- (c) In cases free from refractive errors which involve an adductive insufficiency or excess.
- (d) In cases involving corrections in anisometropia.
- (e) In determining the advisability of full corrections in myopia.
- (f) In determining the benefit derived from tinted lenses.
- (g) In determining the benefit derived from iseikonic lenses.

In general, this technique seems to be applicable to those cases in which an objective and quantitative indication of ocular comfort would be of value. For example, it seems reasonable to assume that this objective criterion would be more reliable than the introspective reports of children with respect to ocular comfort; and in any case, it should be of value in prognosis. However, it is recognized that any criterion of ocular comfort applied immediately after a given change in refraction will not necessarily appraise the ultimate merit of the change since some adjustment or compensation to the new corrections may be required. On the other hand, this deficiency or inadequacy is not unique to the factor of ocular comfort as a phase of refraction.

EXPERIMENTAL TECHNIQUES

The experimental data presented in tables 1, 2, and 3 involve, with one exception, the frequency of blinking while reading. However, it is conceivable that

other activities may be suitable for clinical purposes in certain cases. For example, the data of Telford and Thompson¹³ indicate an average of 44.5 and 14.4 blinks during a five-minute period of conversation and reading, respectively, for a group of 36 subjects. These investigators suggest that the decreased blinking found during reading is not due to the mental activity involved, but possibly to several other factors; such as, the visual fixation and eye-movements involved in reading. The latter may increase or decrease the so-called normal rate of blinking. In view of these results, it is possible that the rate of blinking could be observed during conversation and while the patient was wearing the different corrections being considered from the basis of ocular comfort. It is also possible that the higher frequency of blinking during conversation would shorten the time required to obtain reliable data. An obvious objection to the latter technique is the fact that information on comfort at the near-point would not be obtained. Therefore, it seems pref-

erable to utilize unfavorable visual conditions, such as low levels of illumination, to increase the frequency of blinking for the purpose of obtaining greater precision where necessary.

The frequency of blinking may be determined either by direct visual observation or automatically through the amplification and recording of the action-currents arising during the interval of blinking. One advantage of the latter method is that longer periods of reading may be utilized. In general, we prefer the visual method, aided by a hand counter, in cases in which the periods of measurement are brief. Obviously, the duration of the experimental period depends upon the differences in visual difficulty among the situations to be appraised. In general, our experiences indicate that a period of five minutes is adequate, although in some cases it is advisable to repeat the series of measurements and use the mean values for interpretation.

Nela Park.

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FUSO-SPIROCHETAL INFECTION OF THE EYE AND ORBIT*

G. L. WALKER, M.D.

Iowa City, Iowa

Ocular inflammation resulting from infection with *Borrelia vincentii* and *Fusiformis dentium* is rare. Dunnington and Khorazo,¹ in a recent survey of the literature, collected 13 cases. In most instances other pathogenic bacteria were present in the exudate, making it difficult to evaluate the rôle played by Vincent's organisms. Gifford² has pointed out that these



Fig. 1 (Walker). Ulcer of conjunctiva and sclera.

bacteria probably are normal inhabitants of many mouths and that they may take advantage of conditions of lowered resistance or neglect of cleanliness, either to produce disease or to live as saprophytes on diseased tissues. Another case which tends to bear out this assumption is presented.

A 47-year-old, white woman with arthritis and secondary anemia was admitted to the University Hospital on August 28, 1937, complaining of a dis-

charging tooth socket and swelling and redness of the eyelids of the right side. The tooth socket had been draining since the extraction of a right, upper, molar tooth, three weeks previously. One week later redness and swelling of the eyelids developed and gradually increased until the day of her admission.

Examination revealed an anemic, emaciated, white woman confined to bed with far-advanced generalized atrophic arthritis. The mucous membranes of the mouth appeared healthy, but in the socket of the first, right, upper, molar tooth was a fistulous tract leading into the antrum. A probe passed through this fistula was covered with foul smelling, purulent discharge.

The lids of the right eye were reddened and almost closed as a result of edema and swelling. A profuse, yellowish-white, foul-smelling discharge exuded from the palpebral fissure. There was moderate proptosis, and the movements of the eyeball were restricted. Both the upper and the lower palpebral conjunctivae were covered with pseudomembranes which upon removal revealed a marked papillary hypertrophy. The entire conjunctiva was diffusely reddened, and the bulbar conjunctiva was chemotic. The pupil measured 3.5 mm. in diameter and did not react to light. The anterior segment of the eye appeared to be normal, the media were clear, and no pathology was seen in the fundus. The left eye was normal.

Smears from the conjunctiva and from the oral fistula, stained by the Gram technique, showed large numbers of spiral and fusiform organisms. Gram-positive rods and Gram-positive cocci also were present.

* From the Department of Ophthalmology, College of Medicine, State University of Iowa. Part of a study being conducted under a grant from the John and Mary R. Markle Foundation.

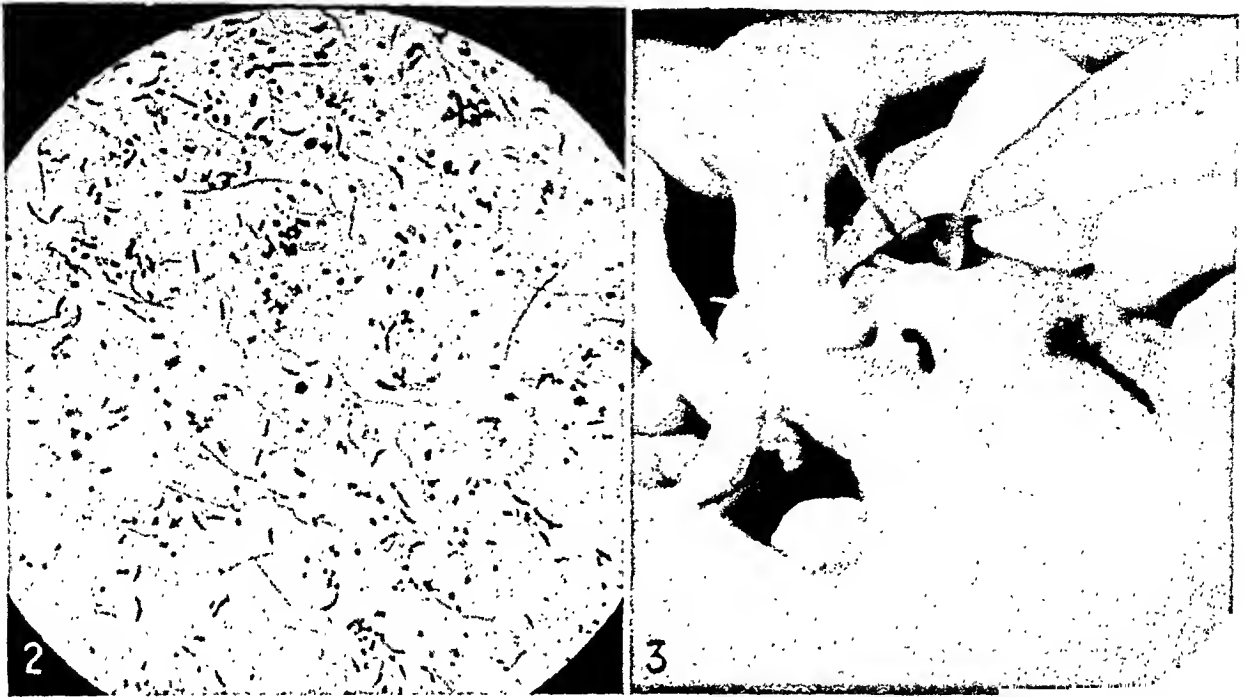


Fig. 2. (Walker). Direct smear from conjunctiva, showing fusiform bacilli, spiral organisms, and cocci. Gram stain.

Fig. 3 (Walker). Probe passed through orbit, antrum, and tooth socket.

Forty-eight hours after admission a perforating ulcer of the conjunctiva and sclera had developed a few millimeters below the lower limbus; through this ulcer protruded a small strand of necrotic tissue (fig. 1). The cornea retained its normal luster, but the anterior chamber was deep, and the pupil widely dilated. Pressure on the soft globe caused distortion of the iris. The vitreous contained large yellowish-white opacities that obscured the fundus. Vision was reduced to light perception.

Smears taken from the area of the scleral perforation showed great numbers of fusiform and spiral bacteria (fig. 2).

The following day, while cleansing the mouth, the fluid regurgitated through the antra-oral fistula and into the conjunctival sac. At this time there was a yellow reflex from the vitreous and from the cornea, which shortly thereafter became opaque and was sloughed. On the ninth day the eye appeared as a purulent necrotic mass and was lifted from the socket

with forceps. A probe was passed easily from the orbit, through a dehiscence in the anterior portion of the infra-orbital plate, into the antrum and out through the tooth socket into the mouth (fig. 3).

Nineteen days after admission, the patient developed fever, headache, photophobia, delirium, and stiff neck. The spinal fluid contained 1140 cells per cubic millimeter and Gram-positive cocci were demonstrated in a centrifuged specimen. Some clinical improvement was noted following intra-thecal prontosil therapy, but two days later the patient died very suddenly.

At necropsy there was a basal meningitis which appeared to have extended from the orbit along the optic nerve. The optic nerve was necrotic and covered with a grayish-white purulent exudate. Gross extension of the inflammation through bone was not demonstrated. The immediate cause of death was found to be a large subdural hemorrhage arising from a ruptured aneurysm of the left internal carotid just proximal to its bifurcation.

The right sphenoid sinus contained a thick muco-purulent exudate.

Therapy: Irrigations of 1-percent sodium perborate and instillations of neoarsphenamine suspended in glycerine were used locally after fusiform and spiral bacteria were demonstrated in smears. Three injections of 0.3 gm. of neoarsphenamine

Repeated attempts were made to cultivate Vincent's organisms aerobically and anaerobically on plain and enriched media, without success. However, anaerobic beta hemolytic streptococci were cultured from the conjunctiva, spinal fluid, and the subdural blood clot.

Sections of the ruptured internal caro-

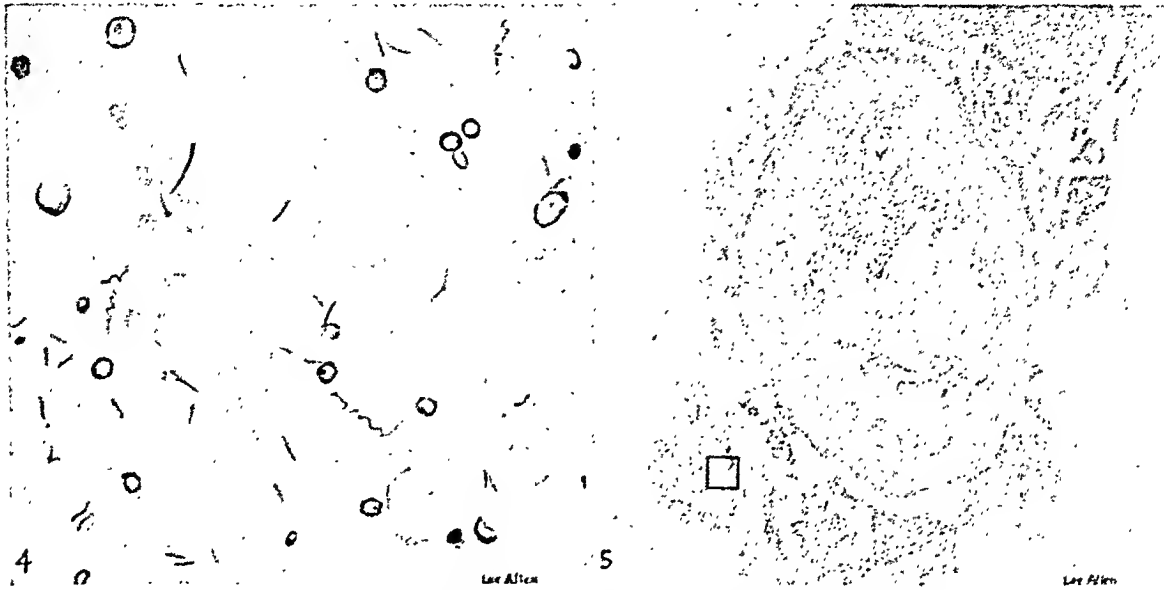


Fig. 4 (Walker). Organisms in exudate surrounding carotid artery.
Fig. 5 (Walker). Relative location from which figure 4 was drawn.

were given intravenously. Intrathecal injections of sulfanilamide were given after the onset of meningitis.

Laboratory findings: Smears from the intra-oral fistula, conjunctiva, and area of the scleral perforation showed large numbers of fusiform and spiral bacteria with the morphology of Vincent's organisms. Gram-positive rods with the morphology of corynebacteria and Gram-positive cocci also were present. Smears taken at frequent intervals from the conjunctival discharge showed the Gram-positive cocci to increase in number as the disease progressed. After the onset of meningitis, smears of centrifuged spinal fluid showed the presence of Gram-positive cocci, but fusiform and spiral organisms were not demonstrated.

tid artery were stained by the Giemsa method and by Verhoeff's technique,³ and large numbers of cocci as well as fusiform and spiral bacteria were demonstrated in the exudate surrounding the ruptured artery (figs. 4 and 5).

DISCUSSION

On the basis of morphology and staining reactions it seems likely that Vincent's symbiotic organisms were present in this case. It is impossible to evaluate their etiologic rôle because of the presence of anaerobic beta hemolytic streptococci. Possibly the poor general condition and lowered power of resistance rendered the patient susceptible to organisms ordinarily saprophytic.

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ANISEIKONIA

A STUDY OF 836 PATIENTS EXAMINED WITH THE OPHTHALMO-EIKONOMETER*

CONRAD BERENS, M.D.

New York

AND

(By invitation)

MICHEL LOUTFALLAH, M.D.

New York

Because aniseikonia is receiving more consideration as a possible source of asthenopia in some of our patients, we believed it to be profitable to study the results of the examinations of patients suspected of having aniseikonia who were observed in the New York Eye and Ear Infirmary and in our own private practice during the past three years.

In this article we will outline briefly some points in the history of aniseikonia and analyze the statistical data compiled from the examination of 836 patients, 125 of whom were from our private practice, in the hope of formulating an opinion in regard to the clinical value of correcting aniseikonia. Although the number of cases in each group of private patients is comparatively small, the entire series has been thoroughly studied and examined, and the majority were treated for asthenopia and other symptoms by the most approved methods before

aniseikonic lenses were prescribed. We appreciate fully the necessity for making a conservative evaluation of any clinical and therapeutic measure because of the lack of satisfactory criteria and controls from which to draw definite conclusions.

The term "aniseikonia," derived from the Greek *ἀνισος*, unequal + *εικων*, image, was used by Ames,¹ at the suggestion of Lancaster, to describe that condition of the eyes in which there is a difference in the size or shape of ocular images (retinal images as interpreted by their corresponding brain centers).

Aniseikonia is of two principal types: (1) Overall difference, in which one image is larger than the other in all meridians, and (2) meridional difference, in which one image is larger than the other in one meridian. Combinations of the two forms may also occur. If ocular images are markedly unequal in size or shape, there may be a disturbance of binocular vision which may or may not be apparent to the patient. However, because the effects may become manifest through the nervous system, the condition has significance not only for the ophthal-

* From the Department of Research, New York Eye and Ear Infirmary. Aided by a grant from the Ophthalmological Foundation, Inc. Presented at the Seventy-fourth Annual Meeting of the American Ophthalmological Society, at San Francisco, California, June 9-11, 1938.

mologist, but also for the neurologist and the general physician.

HISTORY

The inequality of images formed on the retinas was discussed by Donders in 1864 and in 1875 by Wadsworth,² who produced inequality of images by holding a concave cylinder with vertical axis before one eye. Eight years later, in a paper on the apparent curvature of surface produced by prisms, Wadsworth³ described distortion of images by prisms. He pointed out that the refraction of a prism when its rays diverge from a point other than its original source causes a flat surface to appear curved; if the prisms are turned with the bases in it is convex, and if the bases are directed temporally it is concave.

In 1888 Culbertson⁴ described a phenomenon similar to that reported by Wadsworth in 1875. In 1889 Lippincott⁵ described the effect of plus and minus spheres and cylinders placed before the eyes upon the objects observed by the subject. He stressed the fact that such distortions occurred in nearly all cases of anisometropia, and could be eliminated by the constant use of lenses.

In the same year Green⁶ published an article, "On certain stereoscopical illusions evoked by prismatic and cylindrical spectacle-glasses." His illustrations of these illusions are of assistance in understanding the basic principles of aniseikonia. He also pointed out the importance of correcting unequal images by wearing glasses constantly.

In 1899 Risley⁷ discussed "The significance of certain rare forms of ametropia," and reported cases that were relieved by means of lenses. In the same year Jackson⁸ described the management of cases of high anisometropia.

In 1890 Theobald⁹ reported cases of

squint and esophoria due to anisometropia that were cured by the wearing of glasses.

In 1901 Alexander Duane¹⁰ concluded that, in the large majority of cases of anisometropia, full correction could be applied with success, provided the patient was warned that it might take from one to two weeks before he became accustomed to the glasses, and that during this period he must wear the lenses constantly. Duane believed that the causes of temporary or permanent discomfort in wearing glasses were: (a) The strength of the lens *per se*; (b) the unequal prismatic action of the unequally strong glasses; or (c) the presence of muscular deviation producing diplopia. Duane was also of the opinion that the statement that glasses for the correction of anisometropia give rise to trouble by producing retinal images of a different size, was probably fallacious. The proportion of cases of anisometropia with squint, according to Duane, was high.

Anisometropia was also discussed by Delogé¹¹ in 1906. In 1914 Erggelet¹² stated that absolute equality of retinal images could not be obtained from the correction of anisometropia. Erggelet also stated that children whose anisometropia is corrected learn to adjust more readily than do adults who have previously acquired and practiced relations of retinal correspondence in the presence of aniseikonia and who now are suddenly forced to adjust their vision to anisometropic correction.

In 1927 Cattaneo¹³ pointed out that the size of retinal images could be equalized with the proper correction of ametropia and anisometropia, by placing the lens 15 mm. from the cornea.

The consideration of differences in the size and shape of the ocular images has assumed greater clinical importance during the past few years because of the

splendid work of Ames and his associates in the Department of Research in Physiologic Optics in the Dartmouth Eye Institute.¹⁴⁻²⁴ The Dartmouth group has developed methods of measuring differences in size of the ocular images, studied variations in tolerance to differences in size of images, and ground lenses for correcting these differences. Our patients have been tested by the method developed at the Dartmouth Eye Institute.

In 1935 Hughes²⁵ concluded that equalization of the size and shape of the visual images brings relief from the annoying symptoms dependent on their asymmetry in a large proportion (about 80 percent) of cases. Three cases of defective fusion with amblyopia ex anopsia (one with convergent strabismus) and a great inequality in the size and shape of the visual images were reported by Hughes.

In 1936 Hughes²⁶ reported that of 357 cases examined for aniseikonia, 65.8 percent were positive. Only 191 patients received the iseikonic lenses. Complete relief was obtained in 46.6 percent; marked relief in 26.2 percent, and slight relief in 2.7 percent. No relief followed in 24.5 percent. Hughes believes that the correction of aniseikonia may be a means of helping approximately 75 percent of the difficult refraction cases in which symptoms are not relieved by the ordinary methods of refraction.

In 1937 Hughes²⁷ reported that in 14 cases with aniseikonia 10 patients obtained relief by wearing iseikonic zero-power lenses designed to correct the aniseikonia present. He believed that it had been shown that the presence of aniseikonia is independent of any refractive error. Later in 1937²⁸ he discussed aniseikonia with no refractive error.

In 1935 Doane²⁹ stated that aniseikonia exists with emmetropia, and that while the larger number of cases may be

found with anisometropia, the condition does exist with equal ametropia. Of the 370 patients he examined for aniseikonia with the ophthalmo-eikonometer, 70 percent showed aniseikonia.

In a later report by Doane³⁰ of 94 patients who wore iseikonic lenses for at least one year, 68 reported definite relief and 26 reported partial relief. Doane also believed that it required a long time to break down the aversion to spectacles, and that the same is true of iseikonic lenses.

In Hardy's³¹ series of 34 patients for whom iseikonic lenses were indicated either for relief of symptoms or for aniseikonia or for both, 41 percent were improved after wearing the glasses and 41 percent were unimproved. In one patient the effect was not stated, and 14.7 percent were not given lenses.

In 1932 Madigan²² and Carlton reported that in approximately 20 percent of 96 cases, correction of size differences apparently brought complete relief, in 60 percent it gave partial relief, and in 20 percent there was no relief.

In 1937 these observers²³ presented statistics on 829 patients examined for aniseikonia at the Eye Clinic at Dartmouth. Of this number, 625 received prescriptions for the correction of aniseikonia, and 500 of these were wearing the correction at the time the study was being made. Of the 500 patients to whom questionnaires were sent, 425 replied relative to the efficacy of the glasses. Definite relief from ocular and general symptoms was reported by 283 (57 percent).

Jackson³² believes that aniseikonia causes no trouble in congenital or in developmental cases, but in adults, when the refraction is corrected and there is disturbance of the sensorimotor coordination that affects binocular vision, symptoms may develop.

Allen³³ offered the opinion that the principal role in the correction of aniseikonia will be found in helping those who occupy the middle place in anisometropia; that is, those between (1) comfortable patients with small refractive differences, and (2) patients with large refractive differences who cannot possibly wear the full correction for eyes with unequal retinal images. Allen believes that the eyes are capable of perceiving a difference in size of 0.25 percent. He also described a method of determining differences in size by the use of central fixation and fusion with the stereoscope. This test will be discussed under examinations for aniseikonia.

One of the arguments against the possible clinical importance of aniseikonia was voiced because of the differences in the ocular images that developed in asymmetrical convergence. The work of Herzau and Ogle³⁴ and some of the observations of the Dartmouth group have shown that the eye apparently compensates for the aniseikonia present in asymmetrical convergence. The exact manner in which the eye adjusts itself to equalize the size of the images is unknown, but it is possible that accommodation is a factor. This paper apparently refutes the statements made by Ludvigh³⁵ concerning the correction of aniseikonia.

Opinions vary in regard to the importance of aniseikonia and as to what the correction of this condition may accomplish. For example, Ludvigh³⁵ believes that differences of image size between the two eyes occur normally in reading. He also states that these differences are much greater in magnitude than those which it has been deemed advisable to correct by the use of aniseikonic lenses. He concludes that the contention for the existence of aniseikonia, other than that due to obvious physical-optical

causes, is based upon inconclusive evidence and derives little support from theory, since it has not been demonstrated that the patients' complaints are attributable to the condition with which the theory deals. However, Brandenburg³⁶ believes that there is every indication that the discovery of aniseikonia marks a new era in the history of the alleviation of human suffering by scientific means.

SYMPTOMS OF ANISEIKONIA

The symptoms complained of by patients who were examined for aniseikonia by means of the ophthalmo-eikonometer are similar to those reported in 1937,³⁷ which included visual disturbances (blurred vision, diplopia, fixation difficulty, and squint), ocular discomfort, photophobia, headache, and general symptoms referable to the gastro-intestinal tract (for example, gastric disturbances, nausea, and indigestion) and nervous system (for example, tenseness, irritability, vertigo, headache, and general nervous exhaustion). Indefinite symptoms of ocular discomfort, aggravated by reading, viewing motion pictures, and driving automobiles, were common complaints. The majority of patients stated that they suffered ocular discomfort and headaches, especially while reading. Ocular pain or pain about the eyes, uncomfortable or blurred binocular vision, burning, lacrimation, and blepharospasm were occasional symptoms.

It is evident that none of the disturbances mentioned is a differentiating characteristic of a specific eye condition, and that many of them apparently are often relieved by wearing ordinary lenses, prismatic lenses, or tinted glasses. Orthoptic training, the treatment of general diseases, and even suggestion and psychoanalysis have also been effective in ameliorating symptoms of this character.

CAUSES OF ANISEIKONIA

There are three groups of physical factors which influence the size of the physical image which falls on the retina: (1) The physical character of the object which includes its size, shape, distance, and lateral position (asymmetrical convergence);³⁴ (2) the optical character of the correcting lens, such as the power, position, flexure, and thickness, and (3) the dioptric character of the eye, which includes refractive error, focal length, and the position of the nodal point.

In addition, there are two groups of neurologic factors that influence the projection of this physical image into space as a mental perception: First, the neuro-anatomy of the receptor mechanism must be considered. This factor depends upon the mosaic pattern of the nerve endings in the retina and upon the distribution of the nerve fibers in the occipital centers. Second, some psychologic factors of the perceptive mechanism are of importance, especially the association with simultaneous perceptions and with previous visual perceptive knowledge and habits.

Hence the ocular images, as we consider them in relation to aniseikonia, are the end-result of these groups of factors. When there is a difference in this end-result between the two eyes, there is a condition of unequal ocular images—aniseikonia.

EXAMINING FOR ANISEIKONIA

In testing for aniseikonia the following statements by Ames and his associates should be considered: (1) It is possible to perceive a size difference of less than 0.25 percent; according to Neumüller,³⁸ however, aniseikonia of less than 0.25 percent should be measurable. (2)

Eyestrain may be caused by a size difference as small as 0.5 percent, although many persons can fuse greater differences with no apparent effort.

Examination with the ophthalmo-eikonometer.—In order to make an accurate test for aniseikonia with the ophthalmo-eikonometer, the patient must have sufficient vision to be able to discern spots and lights on the screen. Best re-

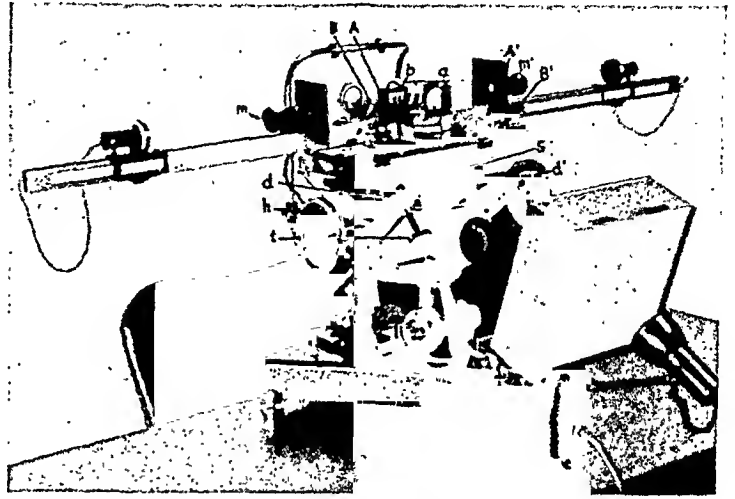


Fig. 1 (Berens and Loutfallah). Ophthalmo-eikonometer.

sults are obtained with vision better than 6/12, or possibly 6/15, in each eye. The patient must have simultaneous binocular perception, with no defect in his central field, and at the same time be able to fuse the images of the large central fixation spot. In cases of diplopia in which images cannot be superimposed spontaneously by the extraocular muscles, no accurate test can be made.

Aniseikonia cannot be considered as independent of other ocular functions. Since distortion of images frequently affects the dioptric condition of the eyes, and *vice versa*, a balanced condition, particularly of accommodation, as well as equalization of image size, is necessary. For this reason the ophthalmo-eikonometer (fig. 1) is designed so that patients may be tested successively for—(1) binocular single vision; (2) visual acuity;

(3) heterophoria and fusional amplitudes; (4) dioptric condition—spherical ametropia and meridional ametropia (astigmatism), and (5) aniseikonia.

STATISTICAL STUDY

In order to clarify our understanding of aniseikonia as a clinical problem an analysis has been made of the results obtained in 711 hospital-private patients (group 1) examined at the New York Eye and Ear Infirmary and 125 private

prescriptions, 62 patients did not obtain their iseikonic lenses, and 36 patients who wore iseikonic lenses did not report upon the effect of the lenses.

Some relief of symptoms was reported by 73 percent of the 368 patients who wore the iseikonic correction, and who reported the effect of wearing the lenses. In 164 patients (45 percent) the symptoms were markedly relieved, in 86 patients (23 percent) they were somewhat relieved, in 19 patients (5 percent) they

TABLE 1

RESULTS OF THE EXAMINATION OF 711 HOSPITAL PATIENTS AND 125 PRIVATE PATIENTS WITH THE OPHTHALMO-EIKONOMETER

	Group 1: Number of Hospital Patients	Group 2: Number of Private Patients
No measurement possible.....	52	12
No aniseikonia.....	132	31
No iseikonic prescription worn:		
a. No prescription given.....	61	19
b. Prescription given but lenses not obtained.....	62	13
No report.....	36	
Iseikonic prescription worn.....	368 (51.8%)	50 (40%)
a. Marked relief.....	164 (45%)	17 (34%)
b. Moderate relief.....	86 (23%)	6 (12%)
c. Slight relief.....	19 (5%)	14 (28%)
d. No relief of symptoms.....	99 (27%)	13 (26%)
Totals.....	711 (100%)	125 (100%)

patients (group 2), some of whom were also examined in the Dartmouth Eye Institute of the Dartmouth Medical School (table 1).

Results of the examination of 711 hospital patients and 125 private patients with the ophthalmoeikonometer. Of the 711 hospital patients (table 1, group 1) examined with the ophthalmoeikonometer, 368 were given iseikonic correction, 52 could not be measured for aniseikonia, 132 patients had no significant aniseikonia (less than 0.5 percent), 61 patients with aniseikonia were not given

were slightly relieved, and 99 patients (27 percent) experienced no relief (table 1).

Of the 125 private patients (group 2), 50 were given iseikonic correction, tests were incomplete in 12 patients, and 31 patients, had no aniseikonia, or less than 0.5 percent. The private patients were examined carefully by all the methods at our disposal, and usually several modes of treatment were tried before the iseikonic lenses were prescribed. Of the patients who had aniseikonia, 19 were not given iseikonic lenses and 13 did not obtain their iseikonic lenses. Some relief of

symptoms was reported by 74 percent of the patients who wore iseikonic lenses. Of the 50 patients who wore their iseikonic lenses, 17 (34 percent) were markedly relieved, 6 (12 percent) were moderately relieved, 14 (28 percent) were slightly relieved, and 13 (26 percent) experienced no relief.

Discussion of table 1.—A comparison of group 1 and group 2 reveals that of

(table 2), in whom we endeavored to determine whether iseikonic lenses would aid in developing fusion; (2) patients with heterophoria and ametropia, in whom we were interested in determining whether the iseikonic lenses would relieve annoying symptoms (table 3); (3) patients with heterophoria with refractive errors whose symptoms were unrelieved by ordinary lenses (table 4); (4) patients

TABLE 2
RESULTS OF TESTS FOR ANISEIKONIA IN HETEROTROPIA
(43 HOSPITAL PATIENTS AND 26 PRIVATE PATIENTS)

	Group 1: Number of Hospital Patients	Group 2: Number of Private Patients
No measurement possible.....	18 (42%)	11 (43%)
Alternating squint.....		5
Monocular squint.....		6
No or slight degree of aniseikonia.....	3 (7%)	5 (19%)
Alternating squint.....		4
Monocular squint.....		1
No prescription given.....	10 (23%)	
No report.....	2 (5%)	
Glasses not worn (2 for cosmetic reasons).....	6 (14%)	4 (14%)
Alternating squint.....		3
Monocular squint.....		1
Iseikonic prescription worn.....	4 (9%)	6 (24%)
Alternating squint.....		4
Monocular squint.....		2
a. Marked relief.....	3 (75%)	1 (20%)
b. Moderate relief.....		3 (50%)
c. No relief.....	1 (25%)	2 (30%)
Totals.....	43 (100%)	26 (100%)

the patients who were given iseikonic lenses in group 1, 45 percent obtained marked relief, 23 percent moderate relief, whereas 5 percent experienced slight relief. However, 27 percent obtained no relief of symptoms. In group 2, 34 percent experienced marked relief, 12 percent obtained moderate relief, 28 percent had slight relief, and 26 percent had no relief of symptoms. Thus it may be seen that approximately the same percentage of improvement was secured in both groups.

Discussion of tables 2, 3, 4, 5, and 6.—An attempt has been made to divide both groups of patients into the following divisions: (1) Patients with heterotropia

with minor errors of refraction (tables 5 and 6); (5) patients with marked anisometropia (a difference in refraction of 2.50 D. or more) (table 6); and (6) patients with reading difficulties (table 7).

Results of tests for aniseikonia in patients with heterotropia.—Of the group of 43 hospital patients (table 2) with heterotropia no measurement was possible in 18 patients, no aniseikonia was present in 3, iseikonic lenses were not prescribed in 10, the iseikonic lenses were not worn by 6 patients, and 2 patients who wore the iseikonic lenses did not report their effect. Of the 4 patients with heterotropia who reported concerning the effect of the lenses, one obtained

unfavorable results and 3 gave favorable reports.

Of the 26 patients in the private-patient heterotropia group (group 2, table 2), many who were examined with the ophthalmo-eikonometer had been operated upon, and all had received orthoptic training. In some of these cases it was impossible to develop stable fusion as tested with the screen test. In others, however, some fusion was finally de-

analysis, 4 private patients and 3 hospital patients with heterotropia apparently were benefited by iseikonic lenses. Table 2 suggests that patients with heterotropia who do not obtain a satisfactory result from operation and orthoptic training, or from orthoptic training alone, should be examined for aniseikonia. However, accurate measurements often cannot be made with the ophthalmo-eikonometer because of the patient's

TABLE 3
RESULTS OF THE EXAMINATION FOR ANISEIKONIA IN HETEROPHORIA AND AMETROPIA
(459 HOSPITAL PATIENTS AND 77 PRIVATE PATIENTS)

	Group 1: Number of Hospital Patients	Group 2: Number of Private Patients
No measurement possible.	25 (5%)	
No aniseikonia.....	86 (19%)	15 (19%)
No prescription given....	41 (9%)	19 (25%)
Prescription not obtained..	36 (8%)	4 (5%)
No report.....	21 (4.6%)	62 (81%)
Effect of wearing iseikonic lenses.....	250 (54.4%)	39 (51%)
a. Unfavorable report..	75 (30%)	11 (28%)
b. Favorable report....	175 (70%)	28 (72%)
(1) Marked improve- ment.....	106	14
(2) Moderate improve- ment.....	56	
(3) Slight improvement.	13	14
Totals.....	459 (100%)	77 (100%)

veloped, but amplitude of fusion was not obtained. Eleven of the tests were incomplete (table 2). Five patients had no appreciable aniseikonia. Four patients did not wear the iseikonic lenses; 2 of these discarded the lenses, after wearing them for a trial period, for cosmetic reasons. Of the 6 patients who wore iseikonic lenses, one obtained marked improvement, 3 moderate relief, and 2 no relief. Of these 6 patients, 4 had alternating strabismus and 2 had monocular squint (table 2).

Discussion of table 2.—In table 2 a comparison of groups 1 and 2 reveals that 9 percent of the hospital patients and 23 percent of the private patients wore iseikonic lenses. According to this age, the limitation of the present apparatus available to us for studying aniseikonia in heterotropia, the lack of fusion, and in cases of amblyopia because of insufficient vision. Work on improved methods for the examination of these patients is now in progress at Dartmouth.

Results of the examination for aniseikonia in patients with heterophoria and ametropia.—Of the 711 hospital patients examined at the New York Eye and Ear Infirmary heterophoria and ametropia were present in 459 (table 3, group 1). In 25 of these patients, no measurement was possible, in 86 patients, no aniseikonia (or less than 0.5 percent) was present, in 41 no iseikonic prescription was given, in 36 the iseikonic prescription was

not worn, and 21 patients did not report concerning the effect of the lenses. Of the patients who reported concerning the effect of wearing the lenses, 75 (30 per cent) reported unfavorable results and 175 (70 per cent) reported favorably. Of those reporting favorably, 106 had obtained marked relief, 56 moderate relief, and 13 but slight relief.

There were 77 private patients (group 2, table 3) with heterophoria and ametropia who were examined for aniseikonia. Of this group, 15 had no appreciable aniseikonia. Of the 62 patients who had aniseikonia, iseikonic lenses were not prescribed in 19, and 4 patients did not obtain the lenses. Of the 39 patients who wore iseikonic lenses, 11 discarded them after a short trial, 14 were markedly relieved, and 14 were slightly relieved.

Effect of iseikonic correction in relieving symptoms in patients with heterophoria.—Of the 28 private patients with

TABLE 4
EFFECT OF ISEIKONIC CORRECTION IN RELIEVING SYMPTOMS IN 28 PRIVATE PATIENTS WITH HETEROPHORIA

Symptoms	Group 2: Number of Patients	
	Relieved	Not Relieved
Headache.....	15*	2
Asthenopia.....	17	—
Reading difficulty..	9	1
Vertigo.....	1	—
Nausea.....	—	1

* Two of these patients were partially relieved.

heterophoria wearing iseikonic lenses, 17 complained of headache (table 4, group 2). Fifteen were relieved by the wearing

TABLE 5
RESULTS OF THE EXAMINATION FOR ANISEIKONIA IN 59 HOSPITAL PATIENTS WITH NO APPRECIABLE ERROR OF REFRACTION

	Group 1: Number of Patients	
No measurement possible.....	1 (2%)	
No aniseikonia.....	17 (29%)	
No prescription given.....	3 (5%)	
Lenses not obtained.....	10 (17%)	
No report.....	3 (5%)	
Effect of iseikonic lenses:		
a. Unfavorable report.....	3 (12%)	} 25 (42%)
b. Favorable report.....	22 (88%)	
(1) Slight improvement.....	1	
(2) Moderate improvement.....	7	
(3) Marked improvement.....	14	
Total.....	59 (100%)	

Ordinary lenses did not entirely relieve the symptoms in any of the 28 private patients with heterophoria who wore iseikonic lenses.

Discussion of table 3.—These figures suggest that 175 hospital patients (70 per cent) and 28 private patients (72 per cent) who had heterophoria and were ametropic were benefited by wearing iseikonic lenses after ordinary treatment had failed.

of iseikonic lenses, although 2 were only partially relieved, and 2 were unrelieved. The wearing of iseikonic lenses gave relief in 17 patients suffering from asthenopia and in one case of vertigo. Of the 10 patients with reading difficulty, 9 were relieved and one was unrelieved, and iseikonic lenses did not relieve the one patient who complained of nausea.

Results of the examination for anisei-

konion in patients with no appreciable error of refraction.—Of the 59 hospital patients who had no appreciable error of refraction (table 5, group 1), no measurement was possible in one case, no aniseikonia (less than 0.5 percent) was present in 17 patients, 3 were not given iseikonic prescriptions, and 10 patients did not obtain their iseikonic lenses. Three patients did not report concerning the effect of the lenses, 3 obtained no relief of symptoms, and 22 (88 percent) reported favorably. Of the favorable re-

ing favorably, 19 were markedly improved, 10 moderately so, and 2 slightly improved.

Twelve of the 28 private patients with heterophoria had anisometropia of less than 1.00 D.; 8 derived marked benefit from the lenses, and 4 obtained partial benefit (table 6).

Of the 48 hospital patients who had anisometropia of from 1.00 D. to 2.50 D., one patient could not be measured, 5 had no aniseikonia, 4 were not given iseikonic prescriptions, and 3 did not

TABLE 6
RESULTS OF CORRECTION OF ANISEIKONIA IN HETEROPHORIA AND LARGE AND SMALL DEGREES OF ANISOMETROPIA (129 HOSPITAL PATIENTS AND 13 PRIVATE PATIENTS)

	Group 1: Number of Hospital Patients			Group 2: Number of Private Patients	
	Under 1.00 D.	1.00 D.—2.50 D.	Over 2.50 D.	Under 1.00 D.	2.50 D. or Over
No measurement possible...	2	1	4	—	—
No aniseikonia.....	6	5	—	—	—
No prescription given.....	2	4	1	—	—
Lenses not obtained.....	5	3	2	—	—
No report.....	2	5	—	—	—
Effect of iseikonic lenses:					
a. Unfavorable report....	7	9	4	—	—
b. Favorable report.....	31 (81.5%)	21 (70%)	15 (80%)	12 (100%)	1 (100%)
1. Marked relief.....	19	11	10	8	—
2. Moderate relief.....	10	7	5	4	1
3. Slight relief.....	2	3	—	—	—
	55	48	26	12	1
Totals.....	129			13	

ports, 14 patients were markedly relieved, 7 moderately relieved, and one slightly relieved.

Results of the correction of aniseikonia in heterophoria and anisometropia.—Of the group of hospital patients, 55 had anisometropia under 1.00 D. (table 6). Two of these patients could not be measured for aniseikonia, 6 had no aniseikonia, 2 were not given iseikonic prescriptions, and 5 did not wear their iseikonic lenses. Of the patients who did wear iseikonic lenses, 2 did not report the effect of the lenses, 7 reported unfavorably, and 31 (81.5 percent) reported favorable results. Of those report-

obtain iseikonic lenses. Of the patients who wore iseikonic lenses, 5 did not report the effect of the lenses, 9 reported unfavorably, and 21 reported favorably. Of those reporting favorably, 11 were markedly improved, 7 were moderately improved, and 3 were slightly improved.

Of the 26 hospital patients (Group 1) who had anisometropia of over 2.50 D., 4 could not be measured for aniseikonia, one was not given an iseikonic prescription, and 2 did not obtain their iseikonic lenses. Of the patients who wore their iseikonic lenses, 4 reported unfavorably and 15 obtained favorable re-

sults. Of the favorable cases, 10 were markedly relieved and 5 were moderately relieved.

There was one private patient with more than 2.50 D. of anisometropia. Iseikonic lenses apparently relieved the headache of which she complained and partially relieved asthenopia.

Results of tests for aniseikonia in patients with reading difficulties.—Of the 21 hospital patients who had reading difficulties in addition to aniseikonia, one could not be measured, and 15 had no aniseikonia (less than 0.5 percent) (table

(7) tests for stereopsis, and (8) studies of ocular fatigue, both accommodation and convergence. Treatment consisted of general medical treatment and of ocular therapy; for example, correcting lenses, special lenses to overcome aniseikonia, and orthoptic training. Exercises were prescribed for convergence, divergence, supravergence, and accommodation. Psychotherapy, consisting of special exercises and training, utilization of the metronoscope (rhythmic reading training), and the use of the typewriter were advised.

Eleven of the 22 patients had no ap-

TABLE 7

RESULTS OF TREATMENT OF ANISEIKONIA IN READING DIFFICULTIES
(21 HOSPITAL PATIENTS AND 22 PRIVATE PATIENTS)

	Group 1: Number of Hospital Patients	Group 2: Number of Private Patients
No aniseikonia.....	15 (71%)	11 (50%)
No determination.....	1 (5%)	1 (5%)
No report.....	3 (14%)	
No iseikonic prescription given.....		5 (22.5%)
Iseikonic prescription worn.....	2 (10%)	5 (22.5%)
a. Marked relief.....	1	2
b. Moderate relief.....	1	3
Totals.....	21 (100%)	22 (100%)

7). Three patients who wore iseikonic lenses did not report. Both patients who reported concerning the effect of the lenses replied favorably. One patient was markedly improved and one was moderately improved.

A group of 22 private patients (group 2, table 7) who complained of reading difficulties were examined with the ophthalmo-eikonometer. In addition, the following complete studies were made of these patients as part of the reading diagnostic service of the New York Eye and Ear Infirmary. The diagnostic technique consisted of: (1) Psychologic studies and reading achievement tests; (2) tests with the ophthalmograph; (3) Betts's ready-to-read cards; (4) routine muscle study; (5) determination of refraction—static and dynamic; (6) visual-field studies;

preciable (under 0.5 percent) aniseikonia and in one no determination was possible. Of the 10 patients who had aniseikonia, iseikonic lenses were worn constantly by 5, 2 of whom obtained marked relief from symptoms, and 3 moderate relief. Five patients were not given iseikonic prescriptions.

SELECTED REPORTS OF THE TREATMENT OF ANISEIKONIA IN SEVERAL PRIVATE PATIENTS

A more detailed report of 4 patients included in the group of 125 private patients shows some of the difficulties encountered in evaluating the results of wearing iseikonic lenses.

Case 1. S. W., aged 14 years, complained of headache after reading for half an hour. He was wearing the follow-

ing ordinary lenses for correction of ametropia: right eye, $+0.25$ D. sph.; left eye, $+0.25$ D. cyl. ax. 105° . With correction, his vision was 6/6 in each eye. The near point of accommodation was 80 mm./300 mm. in the right eye and 240 mm./300 mm. in the left eye. The muscle findings were: at 6 m., orthophoria; at 25 cm., exophoria of 2.5^Δ . The near-point of convergence was 55 mm. His prism divergence at 6 m. was 3^Δ and at 25 cm. 5^Δ ; his prism convergence was 10^Δ at 6 m. and 25 cm.

On November 30, 1935, the patient was given the following iseikonic prescription for near: right eye, $+0.50$ D. sph. combined with 1 percent meridional $\times 90$ degrees; left eye, $+0.50$ D. sph. combined with 1.5 percent meridional $\times 180$ degrees. With this iseikonic correction the near point of accommodation was 105 mm./300 mm. in the right eye and 98 mm./300. in the left eye.

Apparently marked benefit was derived from wearing the iseikonic lenses, for the patient stated that he could not read without this correction and that since wearing his iseikonic prescription he had had no headache. We are still at a loss to explain the rapid changes in accommodation, as there was no demonstrable fatigue of accommodation when he was tested with the ophthalmic ergograph. He apparently had some upper respiratory infection which might have been a factor not only in causing the changes in accommodation, but also in the apparent benefit obtained from the iseikonic correction.

Case 2. J. T., aged 33 years, complained of eyestrain when reading. With his ordinary correction of $+0.25$ D. cyl. ax. 3° in the right eye and $+0.25$ D. cyl. ax. 175° in the left eye, his vision was 6/4.5 in each eye. The near point of accommodation was 200 mm./300 mm. in the right eye and 180 mm./300 mm. in the left

eye. The muscle findings were: at 6 m., esophoria 1^Δ and at 25 cm., exophoria of 30^Δ ; at 6 m., prism divergence was 3^Δ and prism convergence 10^Δ ; at 25 cm., prism divergence was 10^Δ and prism convergence was 15^Δ . The near point of convergence was 140 mm.

Iseikonic lenses were prescribed for near on March 19, 1936. The prescription was: right eye, plano combined with 0.5 percent overall, combined with 2 percent meridional $\times 90$ degrees; left eye, plano. With correction, the near point of accommodation was 130 mm./300 mm. in the right eye and 130 mm./300 mm. in the left eye. On June 26, 1936, when the patient was last seen, he stated that although his eyestrain was not completely relieved, it was much less marked.

This patient obtained only partial benefit from wearing the iseikonic correction. The convergence insufficiency was considered another factor partly responsible for his discomfort.

Case 3. T. M. H., aged 25 years, complained of ocular fatigue, inability to read, and headache. With ordinary correcting lenses of $+0.25$ D. cyl. ax. 180° for the right and left eyes his vision was 6/4.5 in each eye. The near point of accommodation was 120 mm./400 mm. in each eye. The muscle findings were: at 6 m., orthophoria; at 25 cm., esophoria 1^Δ . The near-point of convergence was 35 mm. At 6 m., prism divergence was 8^Δ and prism convergence was 12^Δ ; at 25 cm., prism divergence was 12^Δ and prism convergence 40^Δ .

The following iseikonic lenses for near were prescribed on January 31, 1935: right eye, plano combined with 1.25 percent overall; left eye, plano. The patient was last seen on September 9, 1935; with his iseikonic correction he was able to read without difficulty for from two to three hours, and marked improvement of ocular symptoms was noted. In April,

1938, the patient reported that he could not read comfortably or for any length of time without his iseikonic lenses, and that his rate of reading had increased.

Case 4. Miss M. E. S., aged 18 years, complained of eyestrain and headache. With ordinary lenses of -2.00 D. sph. $\ominus -0.50$ D. cyl. ax. 40° in the right eye and -2.00 D. sph. $\ominus -0.62$ D. cyl. ax. 150° in the left eye, her vision was 6/6 in each eye. The near point of accommodation was 100 mm./300 mm. in the right eye and 110 mm./300 mm. in the left eye. The muscle findings were: orthophoria at 6 m. and 25 cm. The near point of convergence was 45 mm. At 6 m., prism divergence was 5^Δ and prism convergence was 10^Δ . At 25 cm., prism divergence was 8^Δ and prism convergence was 25^Δ .

On April 5, 1937, the following iseikonic lenses were prescribed for constant wear: right eye, -2.00 D. sph. $\ominus -0.50$ D. cyl. ax. 25° combined with 1.5 percent overall combined with 1.5 percent meridional $\times 90$ degrees; left eye -2.00 D. sph. $\ominus -0.50$ D. cyl. ax. 165° .

The patient was last seen on November 27, 1937, and showed definite improvement. She was able to read twice as rapidly, and was able to use her eyes from 8 a.m. to 11 p.m. Although her headaches still persisted, they were less severe than formerly.

SUMMARY

A clinical study of 711 hospital patients and 125 private patients examined with the ophthalmo-eikonometer was made in an attempt to evaluate the results obtained following the correction of aniseikonia by means of iseikonic lenses.

A review of the history of aniseikonia reveals the fact that inequality of retinal images was looked upon as a problem in prescribing lenses as early as 1864. The importance of aniseikonia has been stressed by Ames and his associates in

their studies of size differences, and we are indebted to them for much of our present interest in and knowledge of aniseikonia and for methods of diagnosing and correcting this condition.

The symptoms complained of by patients with aniseikonia are not indicative of this condition or of any specific eye disease. The most common of these are: Visual disturbances, ocular discomfort, photophobia, headache, and the general manifestations associated with the gastrointestinal tract and nervous system.

The causes of aniseikonia may be optical, anatomic, or neuropsychologic. The compensatory mechanism for equalizing the size of ocular images which has been shown to exist in asymmetrical convergence by Herzau and Ogle may also be effective in overcoming size differences that occur when the eyes are in the primary position. In our experience we have found that the majority of patients who have worn iseikonic corrections with apparent comfort have been of the "hyper-sensitive" type. Every effort should be made to discover and correct underlying physical and psychologic factors. It is quite possible that small differences in the size of ocular images may disturb one person and be well tolerated by another who is less sensitive. We believe this statement is also true for the ordinary errors of refraction and for low degrees of heterophoria. In addition to eliminating any existing underlying physical causes, it is quite possible that orthoptic training may prove to be a factor in increasing the amplitude of size fusion.

In testing for aniseikonia the ophthalmo-eikonometer is used. It has been stated elsewhere that differences of 0.25 percent are measurable. In order to employ the ophthalmo-eikonometer in testing size differences patients must have vision better than 6/12, or possibly 6/15, in each eye. Moreover, they must be able

to fuse the images of the large central fixation spot on corresponding areas of the retinas.

Aniseikonia must be considered in relation to other ocular conditions. For this reason the ophthalmo-eikonometer may be used to test binocular vision and visual acuity; for heterophoria, fusional amplitude, and refraction, as well as for aniseikonia. The ophthalmo-eikonometer includes a head-rest, cells for trial-lenses, and a dioptric system for studying refraction; a screen is used to project lights and dots. Any disparity in the relative position of the lights and dots indicates the apparent difference in the size of the ocular images. Adjustable size-lenses are used to measure the degree of aniseikonia. These lenses consist of overall and meridional size-lenses.

Although aniseikonia is not always the underlying cause of symptoms in patients who complain of ocular fatigue, asthenopia, and vertigo, when these symptoms are not relieved by correcting lenses and other therapeutic measures the possible existence of aniseikonia should be investigated.

Of the 711 hospital patients and 125 private patients who were examined for aniseikonia, the iseikonic prescription was worn by 368 patients (51.8 percent) in group 1 (hospital-private patients), and in 50 patients (40 percent) in group 2 (our private patients). In group 1, 73 percent of the patients obtained some relief of symptoms, whereas in group 2, 74 percent secured some relief.

CONCLUSIONS

The data presented in this paper would seem to indicate that the correction of aniseikonia may be a factor in some cases in relieving ocular complaints and general symptoms that apparently are not alleviated by the wearing of ordinary

correcting lenses, orthoptic training, and other forms of treatment. In some cases the correction for ametropia was changed, and in others accommodation seemed to be improved for some unknown reason; muscle balance was undoubtedly changed in some instances, and fluctuations in the physical condition may have been coincident with the wearing of the iseikonic lenses; these and other factors should be taken into consideration in evaluating the results. Possibly one of the most important factors, and one that is most difficult to evaluate in highly sensitive or neurotic patients, is the effect of a new, carefully conducted examination and the wearing of a new type of lens.

The more one learns of the correction of aniseikonia, the more one is convinced that there are few if any uncomplicated cases of aniseikonia, and we have pointed out some of the important related factors that should be considered. The experience and conclusions drawn from the study of aniseikonia seem to parallel those observed in the correction of anisometropia and heterophoria.

Until many additional examinations of patients for aniseikonia have been critically analyzed, and improved methods of diagnosing and correcting aniseikonia have been given a thorough trial, it is advisable to preserve a scientific interest in the study of aniseikonia. Some of our patients who complain of asthenopia and other forms of ocular discomfort, and who are not relieved by the usual methods of treatment might well be examined for aniseikonia.

We are indebted to Mr. Harold M. Fisher for the summary of the 711 hospital-private patients (group 1) examined by him on the ophthalmo-eikonometer, and to Miss Dorothy Kern for the summary of the 125 private patients (group 2).

DISCUSSION

DR. EDWARD JACKSON, Denver: The two papers [one by Dr. Lancaster, Ed. NOTE] on aniseikonia bring to our minds the fact that we are dealing with the borderland of natural science and investigation. They both illustrate how closely our observations and vision are related to the question of cerebral action and association. They teach this lesson, that these particular functions are not mathematical optics, or physical optics. They are not the ordinary uses of our voluntary muscles, or the known acts of vision. We are getting beyond the boundaries of what the mass of people have learned to do with their eyes, and individual differences must be considered before we will understand the significance, for instance, of the tables that were presented to us. Take one statement in the paper of Dr. Berens and Dr. Loutfallah: that ordinary lenses had not given satisfaction, but the iseikonic correction was more satisfactory. We ought to consider that in these cases the particular individuals possibly had not had a perfect correction of their ametropia. They may possibly have made in early childhood a certain use of the eyes that did predispose them away from perfect association of the two eyes, in the ordinary processes of vision. Until we eliminate such factors we cannot judge any one possible factor in the bringing about of relief. I believe that we must approach this subject with the realization that we are entering a new field; that some lessons which we believe we have learned will have to be reconsidered, before we can judge of the apparently new facts that are brought to our attention.

DR. HERMANN M. BURIAN, Hanover, N.H. (by invitation): Although it might appear presumptuous for me to discuss the papers by Drs. Lancaster and Berens

and Loutfallah, I should like to stress a few points in connection with the aniseikonia problem, since Dr. Lancaster wishes me to do so. First of all, however, I want to congratulate Dr. Lancaster on his masterly presentation of this complicated subject, in which we are especially interested at the Dartmouth Eye Institute, and Dr. Berens and Dr. Loutfallah for the detailed analysis of so great a number of cases.

Dr. Lancaster has hinted at the problem which I have studied and about which I am going to report at the meeting of the American Medical Association, in June, 1938. The importance of peripheral fusional stimuli for the relative position of the two eyes is in itself a well-rounded problem of physiologic optics, and its investigation was not undertaken with a specific regard to aniseikonia. As a side-result, however, as Dr. Lancaster pointed out, we obtained conclusive proof that the measurements of artificially induced size differences are identical, whether they are taken with or without eye-movements. In other words, we are obviously measuring an actual size-difference, not a possible anisophoria. The instrument I used in my experiments is at the Scientific Exhibit of the American Medical Association, and I shall be glad to demonstrate the effects to any one interested in them. This instrument allows one to measure aniseikonia also in cases in which there is no binocular vision, provided that the innate retinal correspondence is intact.

I should like to mention one point which I believe has thus far not sufficiently been brought out in the discussion of aniseikonia. We must assume that the relative difference in the size of the ocular images gives rise to difficulties in fusing the images of the two eyes. The

result is that in persons affected with aniseikonia the constant struggle to bring about and maintain fusion produces the well-known symptoms. We must rely on the reports of the patients as to the relief they obtained by wearing an iseikonic correction, and from these reports we must draw our conclusions concerning the validity of our assumption of the effectiveness of size-corrections. There is, however, an objective sign which seems to me especially convincing as to the value of aniseikonic corrections for the achievement of perfect binocular vision. This is the fact that, through the wearing of an iseikonic correction, a marked improvement of depth perception can be obtained. In a number of cases intelligent patients who are careful observers report spontaneously that they have noticed such an improvement, or that, for the first time, they have experienced real stereoscopic, three-dimensional vision. In connection with this they often report a considerable improvement in fine, close work and certain outdoor activities. We have checked this subjective impression of the patients—for instance, with the Keystone chart—and found that there actually is a very marked improvement in their depth perception. If such patients do not wear their glasses for a few hours, their depth perception will be more or less reduced. Immediately after putting on the glasses they show 100-percent depth perception, and they do not lose it for a longer or shorter time after taking the glasses off again.

Finally, I should like to mention an-

other point. Dr. Berens has stated that in his cases there was no noticeable influence of the iseikonic corrections on the phorias of the patients. This is not astonishing, and it is evident that we cannot expect such an influence, if we define the phorias as the position of rest of the eyes. This position, in so far as it is due to mechanical factors, can, of course, not be expected to change. Under normal conditions of seeing, it is not true that all innervational influences are excluded, and we can readily conceive that it will be much easier for a patient with a considerable amount of phoria to overcome the anomaly in the position of rest, if the process of fusion is facilitated by matching the images of the two eyes. This is probably another important factor which contributes to the great benefit some patients derive from the wearing of iseikonic corrections.

DR. CONRAD BERENS, closing: I would like to thank Dr. Jackson for his remarks. I do not know whether I quite understood them, but I would like to refer him to the first paragraph of the conclusions in our paper.

I did state that this particular patient, as well as others, had actually tried ordinary lenses, and then changed to the iseikonic lenses. My desire was to make clear how difficult it is to evaluate the results obtained in these patients.

Dr. Burian has added important data to the material we have presented, and I hope that the Society will continue to give this problem further scientific consideration.

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ADRENAL NEUROBLASTOMA AND ITS OCULAR SYMPTOMS

A CASE REPORT WITH AUTOPSY

HEDWIG S. KUHN, M.D.

Hammond, Indiana

Neuroblastoma is one of the three types of sympathetic-nerve tumors which arise from the adrenal medulla. Being composed of undifferentiated cells, it is the most malignant and also the most frequent tumor found in this organ. The two other pathologic types of sympathetic-nerve tumors, ganglioneuroma and chromaffine-cell tumor, arise from adult cells; they cannot always be sharply separated from neuroblastomas, as newly formed elements of all three types may be found in the same tumor and cases of purely one type are rare (Wahl¹). Virchow,² in 1864, was the first to recognize its nature, but referred to it as glioma; Marchand³ (1891) discovered its neural nature, and Pepper⁴ (1901) and Hutchinson⁵ (1907) described very clearly its characteristic clinical pictures; but not earlier than in 1910 was the term "neuroblastoma" used, and the neuroblastic theory established by Wright.⁶

With regard to the clinical appearance of the disease, there have been described two different types. The one that is of most interest for ophthalmologists is the Hutchinson type, in which metastases occur chiefly in the orbit, skull, meninges, and long bones. Leinfelder⁷ stated that the other type, described by Pepper, has no ocular manifestations, since metastases occur primarily in the liver; but Klein⁸ (1932) described a case which he attributed to the Pepper type, with ecchymoses over the lids of both eyes, and Boyd⁹ admits that the bones of the skull are occasionally involved also in cases of the Pepper type. Frew¹⁰ (1911) is of the opinion that spread of the neoplasm occurs via the lymphatics and that ana-

tomatic consideration will explain the two different clinical types. Wahl, however, believes that the metastases occur chiefly by way of the blood stream. According to Geschickter¹¹ (1933) clinical division between the two types is pathologically misleading, as the various manifestations caused by the metastatic predilections for certain regions are dependent neither on the cell type nor on the relation of the primary tumor of the neighboring lymph or blood vessels but rather to the age of the patient.

The disease occurs nearly exclusively in young children, mostly—in about one half of 40 cases of Lewis and Geschickter—under three years of age, sometimes even in fetal life, very seldom in children over the age of 10 years. Cases in adults have been described, but, according to Boyd, such a diagnosis is extremely risky. No cases in adults have been reported with any ocular complication. There seems to be no preference for the male or female sex, and heredity probably plays no part.

The disease is very rare. In 1933, Scott, Oliver, and Oliver¹² collected from the whole literature 158 cases of adrenal-medulla tumors, only 83 of which were sympathico-blastomas. In 1934, Lewis and Geschickter¹³ published 40 cases more, 33 of which occurred in the medulla of the suprarenal gland. In 1935, Leinfelder added three new cases. Saphir¹⁴ saw adrenal neuroblastoma once in 3,950 autopsies. Frew stated that in 7,000 autopsies on children under 12 years of age only 24 cases were reported. Ocular complications were mentioned in one of 9 cases of Wollstein,¹⁵ in 2 of 17

cases of Askin and Geschickter,¹⁶ and in all 3 cases of Leinfelder, also in 26 of the 40 cases of Lewis and Geschickter. In an overwhelming majority ocular complications, especially metastases in the orbit, occurred first on the side corresponding to the seat of the adrenal tumor.

The clinical picture is quite characteristic, though the symptoms vary, and are not all found in every case. The common features are: paleness, irritability, and complaints about pains in the extremities, then discoloration of the eyelids, uni- or bilateral, swelling about the bones of the skull, proptosis of one or both eyes, rapid progress of the anemia, and decay, the more rapid the younger the patient is. In many cases of this Hutchinson type, the existence of an abdominal tumor cannot be proved by clinical examination and is found only at autopsy.

Exophthalmos, the most striking and alarming symptom, may extend to such an extreme degree that the cornea is destroyed by ulceration, because the lids do not cover it. Tileston and Wolbach¹⁷ describe a proptosed globe which almost entirely left its socket, being pushed outward, downward, and inward, so that it nearly touched the nose. Muscle rotations are often limited or impossible, the optic discs choked, the pupillary flexes absent, the vision defective or destroyed, but all these features may be absent. The papillitis may be due to two factors: the compression of the whole brain with pressure on the ventricles, and the compression of the optic nerve by the orbital tumor which is also the cause of the proptosis. Seefelder¹⁸ reports that in his case the superior orbital fissures and the regions of both optic foramina were filled out with tumor tissue and both optic nerves were as if walled-in by it. In the case of Cohn¹⁹ the orbital tumor broke through into the maxillary cavity and the hard palate, in

Lederer's^{19a} case the mass in the orbit was also in continuity with the superior maxilla.

The orbital tumor is not clinically evident in every case, but it sometimes becomes visible, bulging the eyeball in a certain direction or, as in Hill's²⁰ case, pushing the lower lid out several millimeters. In other cases, a distinct tumor soft tissue was felt in the orbit (Wessely,²¹ Quackenboss,²² Lederer, and other authors). Quackenboss, in 1910, proved the existence of a metastasis to the orbit at biopsy; Hill, in 1929, made the diagnosis of a probable neuroblastoma metastatic from the adrenal by removing and examining the orbital growth in a child, three months before a mass in the region of the involved kidney became palpable. Tileston and Wolbach (1908) and Platt²³ (1911) found orbital tumors by autopsy, but they took them for metastases of adrenal sarcoma. After these, several other authors proved by autopsy the evidence of orbital metastases in adrenal neuroblastomas. Wessely, who in 1919 erroneously claimed to be the first author to write about orbital metastases in adrenal neuroblastoma, found the lacrimal gland in his case imbedded in the orbital growth and appearing slightly hypertrophic. After removal it was found involved with tumor-cell conglomerates spread among the lamellae of the bone. In Leinfelder's second case the lacrimal glands were also found enlarged. Lagophthalmos, with the possibility of actively closing the lids for defense, was seen in a case of Coppez, Simon, and Claes;²⁴ ptosis, however, in Seefelder's case. As another rare feature, Smith²⁵ described a remarkably rapid growth of the eyelashes in a 17-months-old child. Lederer saw facial paralysis developing during hospital observation. The enlargement of the head, which together with secondary anemia and cachexia belongs

to the most outstanding symptoms in this disease, is due to the increased intracranial pressure (hydrocephalus) and in part also to local metastases bulging the bones of the skull.

The roentgenogram showed a characteristic picture in the cases of Lederer, of Askin and Geschickter, and of Leinfelder, consisting in hydrocephalus with wide separation of the cranial sutures and osteoporosis in the bones of the skull, pelvis, and in the long bones, and in Lederer's case orbital processes in the frontal bone. But in the examples of Wessely and of Coppez, Simon, and Claes, the orbits appeared normal upon X-ray illumination, though orbital metastases became evident by biopsy and autopsy, respectively. This phenomenon is easily understood on consideration of the softness of the tumor, which makes it sometimes appear like a hemorrhagically infarcted tissue. While opening the orbital cavity, Wessely found a spongy, vascular tissue which collapsed, discharging masses like clotted blood. Even two operations, by which tumor tissue was removed and microscopically examined, could not completely clear up this case as long as the child was alive. According to Seefelder the extension of free bleedings in bone metastases not infrequently passes that of the tumor masses themselves. He regards the ecchymoses in the lids as carried away from the bleedings in the bone metastases.

The diseases for which adrenal neuroblastoma may be mistaken are (1) infantile scurvy, which causes ecchymoses and proptosis; (2) chloroma, which shows unilateral proptosis and tumors about the skull; (3) acute rheumatism in cases accompanied by fever and pains in the extremities or joints; (4) myeloblastoma, (5) lymphoma, and (6) lymphosarcoma.

In nearly all cases therapy was without any lasting success. Lehmann,²² who, in

1916, made a complete excision of the tumor in his 11-months-old patient, reported him well 15 years later. Since then other patients have been successfully operated upon, but those cases evidently are extremely rare, for, almost always, the growth has already metastasized into the body at the time of the first medical examination. Temporary recession of the ocular symptoms occurs after surgical treatment (Wessely) as well as after roentgen-ray therapy (Leinfelder), but only to become worse shortly afterwards, than it was before. Hill dissected the orbital tumor in capsule easily and completely, nevertheless death occurred three months later. Seefelder declares any operative treatment of the orbital condition as distinctly contraindicated. Askin and Geschickter found that irradiation with X rays or radium did not alter the speed of metastases, and that surgical intervention was followed by death within a month in nearly one half of their cases.

REPORT OF A CASE

Charles S., aged 2 years and six months, first came to our office on June 17, 1935. About two months previously he had had an acute infection of both eyes, accompanied by swollen lids and purulent discharge. His right eye eventually cleared up, but in the left the eyelids remained edematous. The eye gradually became more prominent. The discharge did not clear in the left eye nor did the eye recede.

Examination then showed the left eye considerably proptosed and the globe fixed; also considerable thickening of the tissue over the left axilla (fig. 1). The pupil was small, dilated, and did not react to light. There seemed to be no tenderness, redness, nor signs of inflammation. The disc was pale. It was impossible to make a detailed fundus study, due to the lack of cooperation. An immediate enucleation followed by X-ray treatment

was advised, but the parents refused.

X-ray examination (Dr. C. W. Rauschenbach) June 18, 1935: "There is normal development of the cranial bones of the skull. There is no evidence of an osseous or opaque tumor to be noted in either orbit. The frontal sinuses are absent. Both ethmoidal sinuses and both maxillary sinuses are normal. The patient is noted to have an exophthalmos in the left eye, but there is no evidence of any bone lesion, and I therefore conclude that this must be the result of a soft tissue tumor. There is normal dental development."

On August 19, 1935, the patient returned and there was found to be a tremendous growth in and around the left orbit (fig. 2). The globe was luxated before the interpalpebral fissure, there was a tremendous chemosis of the conjunctiva, and the cornea was ulcerated. The optic disc was not very pale, the

parents were given little hope for the child's recovery. A week later there was edema in the right disc and retina which seemed to interfere very considerably with the patient's vision.



Fig. 2 (Kuhn). The eye on August 19, 1935.

Pathological report (Dr. Frederick H. Verhoeff) September 3, 1935: "The tumor of which you sent me a section now shows so little differentiation that I cannot be sure as to its origin. Its appearance, however, is consistent with that of a neuroblastoma arising from the adrenal, so that this is the most probable diagnosis. In any case, I feel sure that the tumor is metastatic in origin." From the Army Medical Museum came the following report on September 9, 1935. "We made preliminary paraffin sections in the case of C. S. and find a malignant tumor in the orbital tissue outside of the eyeball. Because of the fact that the eye had been opened it was impossible to make a satisfactory gross examination of the structures within the eye, and we will have to wait until the microscopical sections are finished before we can make any statement concerning the origin of this tumor. The cytology, however, is somewhat like that of neurocytoma, a malignant tumor which usually arises in the adrenals and metastasizes quite widely. We would appreciate some more information concerning the possibility of there being an



Fig. 1 (Kuhn). Appearance of eye on June 17, 1935, on admission.

retina was normal, and there was no pigmented area. On August 22, 1935, consent was finally given, and the eyeball and orbital contents were completely removed up to the apex of the orbit. The

intra-abdominal tumor in this case. Meanwhile, the celloidin sections are being prepared. This will require a period of approximately two months time."

November 14, 1935. The patient gradually failed, a large mass of hard glands developing in front of the left ear and in the neck on this side. The orbit had filled with proliferating tissue in six weeks, but there was not much bulging

mandibular articulation. It is noted to extend into the left orbital fossa. I am unable to make out any tumor mass in the abdomen. This patient's large intestine is greatly distended with gas pockets. The great amount of intestinal gas is noted to displace the diaphragm upwards. There is no effusion in either side of the thorax. There are no evidences of metastases in the bases of either lung."

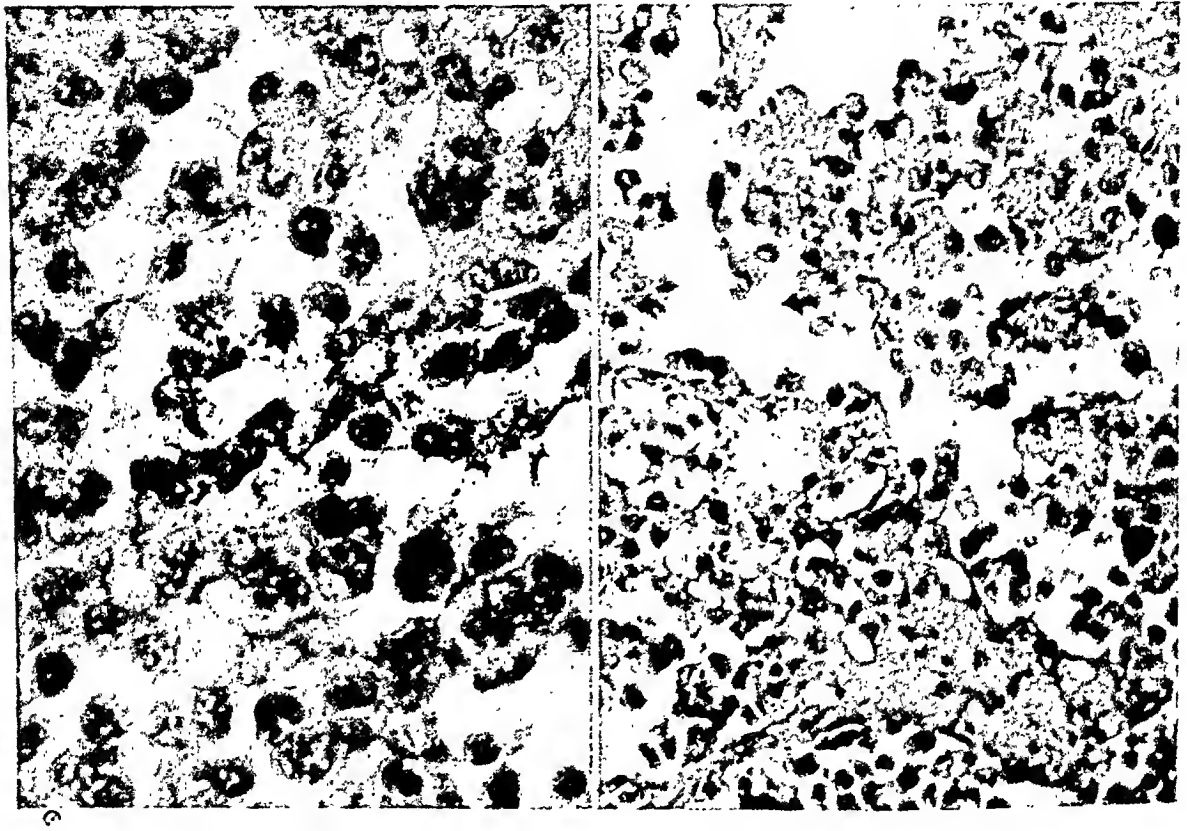


Fig. 3 (Kuhn). High- and low-power appearance of tumor tissue.

forward from it. A swelling in the face of the maxilla was breaking through into the soft palate, and there was a gradually increasing inanition. There was no demonstrable enlargement of the body.

An X-ray examination (Dr. C. W. Rauschenbach) disclosed: "... a large soft-tissue tumor situated on the left side of the face. This tumor appears to have involved the neck and head of the left mandible and also appears to involve the left orbit, mastoid area, and temporo-

On November 13, 1935, the patient died and an autopsy was performed. Permission to open the head was not, however, obtained.

AUTOPSY REPORT

Head. The left eyeball and contents of the orbit had been removed previously at operation. A swelling on left side of the face extends from the left and involves the lymph glands situated over the parotid gland and submaxillary lymph glands. Large masses also are present in

the skin of the left cheek. The eye socket is filled with a friable, hemorrhagic tumor mass which on being incised, emits a chocolate-colored exudate. The masses over the cheek are rubbery in consistency and adherent to the deep structures. Several of the parotid lymph glands are about the size of walnuts, some of them adherent to each other. These are adherent to the deep fascia but not to the skin. The swelling begins about the left temple, extending posteriorly so as to push the pinna of the ear anteriorly. It extends anteriorly past the mid-line so as to involve the right eye. The nares are displaced upwards. The swelling displaced the palate down, pushing the teeth forward. The swelling of the palate involved the left side and extended slightly past the midline to the right. A large tumor mass, the size of a walnut, was also observed at the center of the forehead. The right eye was proptosed and partially fixed. Right parotid gland was also involved.

Chest. In the posterior portion of the pleural cavity, at the level of the eighth rib, there was a mass the size of a walnut which seemed to arise from the bone and was covered by pleura. The outside of the mass was smooth in consistency, adherent to the rib. When the mass was incised, a jellylike material exuded which was chocolate colored. Another similar mass was present in the right pleural cavity at the level of the second rib anteriorly. The pericardium also had similar masses about the size of walnuts, and of the same consistency. The heart and lungs were normal.

Abdominal cavity was normal.

Right Kidney was normal in size and consistency; no tumor masses were associated with it.

Left Kidney. A large tumor mass extended from the adrenal gland to cover the anterior surface of the kidney. The

mass was the size of a chestnut and friable in consistency.

Histopathologic study. The greatest part of the orbital space is replaced by a tumor which reaches close to the globe and which infiltrates the ocular muscles and the orbital fat in strands. The muscle fibers near the tumor become smaller, break, and lose their cross stripes; between the fibers are hemorrhages.

The tumor consists mostly of small round cells. Between them can be seen some larger ones with greater nucleus and less chromatin substance. Some of them look like nuclei of ganglion cells. Mitosis appears in a few spots and, in some places, karyolysis.

The cells lie very tight and have a little fibrillar intercellular substance. The cells have a fair amount of protoplasm; there are basophile granula in some of them. There are a few rosettes, and several hemorrhages in the tumor.

CONCLUSIONS

As is seen by the literature, reports of cases of adrenoblastoma with autopsies are very rare. In our case the ocular symptoms clinically resembled those that Hutchinson described as a significant group. The remarkable thing in this case is the tumor, which could not be located clinically but was first found at the autopsy located in the left adrenal. The tumor of the orbit, as is usual, was on the same side. In the X-ray examination, it appeared as a tumor of the base of the cranium with destruction of the bony orbit and its adnexa, especially the mandibular joint, forcing forward the eyeball.

After removal of the orbital tumor the child was for a time in better condition, but he soon developed cachexia and died. The literature also indicates that removal of the tumor or treatment with radium or X ray has a good influence on the pa-

tient's general health, but that a permanent result has never been obtained. Until now only radium or X-ray treatment of the primary tumor has been attempted. It has never before been removed surgically.

It was very difficult to arrive either clinically or histologically at the correct diagnosis. Differential diagnoses to be mentioned are sarcoma and retinoblastoma. In their arrangement, the round cells resembled a round-cell sarcoma, and this diagnosis was made first, but soon corrected, and the tumor was identified as belonging to the group of tumors

of the nervous system. The cells contained relatively much protoplasm, and there was hardly any intercellular substance. Larger cells were present, especially the ganglion type of cells and some rosettes. These findings led to the diagnosis of a neuroblastoma. As the eyeball and the optic nerve were not primarily affected by the tumor, but only secondarily, only a neuroblastic tumor could have been present, the origin of which is nearly always the sympathetic nervous system.

The clinical events and the autopsy finally confirmed these conclusions.

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CULTIVATION *IN VITRO* OF HUMAN CONJUNCTIVAL AND CORNEAL EPITHELIUM*

PHILLIPS THYGESON, M.D.
New York

Tissue culture has found wide application in the study of viruses, not only in securing their propagation outside the body, but also as a means of studying their properties, in particular their effects on cell reactivity and morphology (inclusion-body formation). Chick-embryo tissues are most conveniently obtained, and have been found to support the growth of most viruses, even those that are incapable of infecting the adult chicken. Certain viruses, however, are more fastidious in their growth requirements and have not as yet been cultivated. Among these are three that involve the eye; to wit, the viruses of trachoma, inclusion blennorrhoea, and molluscum contagiosum.

In view of the strict epithelial localization of these viruses and their failure to infect the common laboratory animals, human epithelial tissues, conjunctival and corneal, were chosen for study as offering the most likely mediums for successful cultivation. When a review of the literature failed to disclose adequate data on the cultivation of these tissues, a search for a suitable technique became the first necessity. For this purpose Dr. Alexis Carrel, of the Rockefeller Institute for Medical Research, very kindly granted me the facilities of his laboratory, and I wish to express to him, to Dr. A. H. Ebeling, and to other members of

his staff my appreciation for their very full coöperation.

The following report contains a description of the testing of various standard tissue-culture methods and the finding of a technique believed to be appropriate for the growth of the epithelial tissues in question.

METHODS

Selection of tissues. The surgical staff of the Institute of Ophthalmology furnished normal conjunctival tissues from patients of varying ages and from a wide variety of sites, the greater number coming from the bulbar conjunctiva. The corneal material was not so varied. Fetal cornea was obtained in a few instances, but most of the material was secured from corneas from which grafts had been taken for keratoplasty operations. The tissues were generally used within an hour or two of their removal, but excellent growths were still obtained with tissue refrigerated at from 6° to 8° C. overnight.

Sterilization of tissues. The fact that the conjunctiva and cornea are exposed surfaces suggested that there would be considerable difficulty in obtaining bacteria-free tissues, and in the preliminary experiments the tissues were passed through dilute Dakin's solution. It was soon determined, however, that in the majority of instances washing them in several changes of Tyrode's solution insured sterility.

Materials. The following standard solutions and mediums¹ were employed: Tyrode solution, 0.02-percent phenol red in Tyrode solution, human serum, embryo extract, and chicken plasma.

The Tyrode and phenol-red solutions

*From the Department of Ophthalmology, College of Physicians and Surgeons, Columbia University, and the Institute of Ophthalmology, Presbyterian Hospital, New York. Aided by grants from the Proctor Fund and the Committee on Scientific Research of the American Medical Association. Read at the Seventy-fourth Annual Meeting of the American Ophthalmological Society, at San Francisco, California, June 9-11, 1938.

were made in triple-distilled water and sterilized by passage through Berkefeld N filters.

In order to secure clear plasma the roosters from which the plasma was obtained were not fed for 24 hours before being bled. Chilled paraffin tubes were used to prevent coagulation. Human serum was obtained in the same way from subjects who had fasted at least 15 hours.

The embryo extract was prepared by diluting minced washed eight-day chick embryos with 0.25 c.c. of Tyrode solution per embryo. After centrifugation the supernatant fluid was drained off and stored in small tubes.

Carrel D 3½ flasks and microflasks of Pyrex glass were employed.

1. Plasma-clot technique

Plasma-clot cultures made in Carrel D 3½ flasks by the Carrel method proved successful. The medium employed was prepared as follows:

0.25 c.c. chicken plasma, diluted 1: 2 with Tyrode solution.

0.25 c.c. phenol red (0.02 percent) in Tyrode solution.

0.50 c.c. human serum.

1 capillary drop embryo extract.

Five small squares of tissue, cut with a cataract knife, were placed in each flask. Dilute chicken plasma rather than human plasma was used because of its greater resistance to liquefaction. It seemed to have little if any inhibiting action on the human tissue.

In successful cultures a slowly developing epithelial growth, preceded by a migration of wandering cells, was usually visible after 24 hours' incubation at 37°C. Fibroblasts began to appear in about 48 hours, and eventually overran the epithelial growths.

Epithelial tissues were found to grow somewhat better in small dilute plasma clots with superadded medium: A few drops of diluted chicken plasma (1 part to 2 parts of Tyrode solution) were

placed in the flask, and then the squares of tissue and 1 drop of embryo extract added. When a clot had formed, 1 c.c. of medium (0.5 c.c. human serum; 0.25 c.c. Tyrode solution; and 0.25 c.c. 0.02-percent phenol red) was added; the pH was adjusted to approximately 7.4 with a gas mixture consisting of 3 percent CO₂, 21 percent O₂, and 76 percent N₂. In this medium the first extension of epithelial cells was observed in a few hours, and good growths were often obtained within 24 hours.

2. Semifluid technique

In this method a drop of dilute chicken plasma was pipetted into a D 3½ or a microflask and spread over its surface. Five or six squares of tissue were then placed in the flask and a drop of embryo extract added. After thorough mixing the excess plasma was drawn off until just enough remained to attach the tissue to the glass. After a period of five minutes or longer the usual medium (human serum, Tyrode, and phenol red) was added and the pH adjusted to 7.4.

This method yielded a high percentage of epithelial growths (29 of 38 attempts), and the rate of growth was considerably more rapid than in the plasma-clot cultures. The cultures maintained themselves well and could be washed and their medium changed without damage. This method, indeed, seemed well suited to most purposes, and in morphologic studies was far superior to the plasma-clot method on account of the better staining properties of the growths obtained with it.

3. Fluid technique

In this technique the usual medium (human serum, Tyrode, and phenol red) was used without the addition of plasma. The squares of tissue were placed, with proper spacing, into the flask containing the medium, and the flask was left un-

disturbed for at least 48 hours in the incubator at 37°C. In successful cultures the tissue settled to the bottom of the flask and the epithelium grew out over the glass. The growths were poor compared with those obtained with the semi-fluid technique, but this was doubtless due, in part at least, to unfavorable laboratory conditions. The sensitivity of developing tissues to vibration is well known, and during the period of this study the laboratory was subjected to a great deal of vibration from building construction near at hand. In the absence of vibration the technique might well have been more successful.

Staining techniques. Two satisfactory staining methods were utilized—the hematein-and-eosin method described by Rhodes,² and the Giemsa method. The former was the better for cultures in thick clots, since the clot itself stained but faintly, but for thin clots or fluid or semifluid cultures the Giemsa method was much to be preferred.

In the Rhodes method the flask to be stained, after removal of the medium and several rinsings with Tyrode solution, was filled with hematein solution (absolute methyl alcohol, 15 parts; glacial acetic acid, 1 part; formaldehyde (40 percent), 2 parts; and Mayer's acid hemalum, 1 part). After standing for 10 minutes in this solution the flask was rinsed carefully with methyl alcohol and then with tap water; partial dehydration with absolute alcohol followed, and counterstaining with alcoholic eosin for one minute. The culture was then washed in absolute alcohol and flooded with xylol until dehydration was complete. It was then ready for examination.

By the Giemsa method the culture to be stained, after removal of the medium and washing with normal salt solution, was fixed for five minutes or longer with absolute methyl alcohol. The alcohol was

then removed and the flask filled with a dilute Giemsa solution, prepared by mixing one drop of stock Giemsa with 2 c.c. of neutral distilled water. The staining process was continued for two hours or longer, according to the strength of the stock Giemsa employed; the stain was next removed and the culture rinsed in distilled water. It was then ready to be examined.

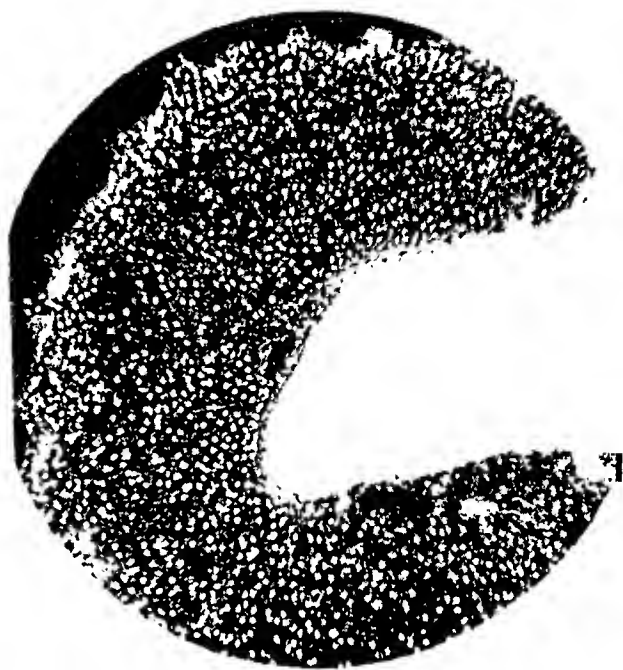


Fig. 1 (Thygeson). Thirty-six-hour growth of epithelium developing from a conjunctival explant. Giemsa stain. ($\times 150$.)

Fluid cultures can be allowed to dry and will keep well. Cultures having a plasma clot must be examined while they are still moist; if they are allowed to dry, the clot cracks and becomes opaque. Permanent preparations could be prepared by washing in alcohol, dehydrating in xylol, and mounting in cedar oil.

CHARACTERISTICS OF CONJUNCTIVAL EPITHELIUM GROWING *in vitro*

Epithelial cells from conjunctival explants grew out in continuous sheets (fig. 1), and at the end of 48 hours formed an extensive growth, usually



Fig. 2 (Thygeson). Fifty-six-hour growth of conjunctival epithelium, showing multilayer development at periphery. Giemsa stain. ($\times 150$.)

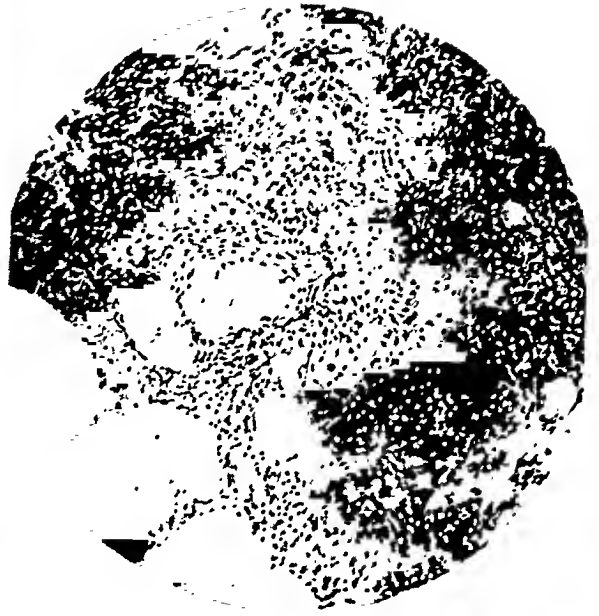


Fig. 3 (Thygeson). Extensive growth of conjunctival epithelium, showing formation of dilisces in the membrane. Giemsa stain. ($\times 150$.)



Fig. 4 (Thygeson). Epithelial cells at edge of new growth. Giemsa stain. ($\times 1750$.)



Fig. 5 (Thygeson). Fibroblasts developing from a conjunctival explant. Giemsa stain. ($\times 150$.)

single layered. As the culture aged, secondary changes in the type of growth appeared. These consisted in a heaping-up of the cells at the periphery (fig. 2)

—sometimes quite marked—and in the formation of dehiscences in the membrane (fig. 3). Thus in old epithelial cultures the growth sometimes formed a syncytium rather than a membrane.

When the cells were observed with

×60 water-immersion objective and ×15 ocular in D 3½ flasks, or with ×90 oil-immersion objective and ×15 ocular in microflasks, they appeared to be somewhat more granular (fig. 4) than epithelial cells taken directly in scrapings from the conjunctiva. This difference was less marked in young cultures (24 to 48 hours). There was often great variation in the size of the cells, some being extraordinarily large. In some cultures nuclear extrusions were common; in all cultures there was vacuolation of the cytoplasm in a number of the cells. Of considerable interest was the formation, in large numbers in fluid cultures, and in small numbers in semifluid cultures, of large multinucleate giant epithelial cells. No bodies that could be confused with virus inclusions were observed at any time.

Epithelial cells from conjunctival explants showed no morphologic differences with respect to their source, whether bulbar conjunctiva or upper fornix, nor did they differ in any material way from cells derived from corneal explants. The age of the subject from whom the explant was taken seemed to have no effect upon cell morphology or rate of growth of the culture.

Epithelial cultures appeared to have considerable resistance—although less marked than fibroblasts—to changes in the pH of the medium, to temperature changes, and to failure to change the medium at regular intervals. In two instances cells continued to grow for some time after the appearance of gross bacterial infection.

CHARACTERISTICS OF FIBROBLASTS FROM CONJUNCTIVAL AND CORNEAL EXPLANTS

Fibroblasts were always the third type of cells to grow out from the explants, succeeding the wandering cells and epi-

thelial cells. They usually appeared on the third or fourth day, never before the second. Once it had begun, growth was always extremely rapid, the epithelial growth that had preceded it being quickly overgrown. Very extensive growths,



Fig. 6 (Thygeson). Corneal epithelium developing in pure culture from fragments of a bulla excised from a case of bulbous keratitis. Giemsa stain. (× 200.)

spreading for many millimeters beyond the borders of the explant, were sometimes obtained (fig. 5). In plasma-clot cultures they could easily be transplanted, and representative strains were maintained for eight months and longer.

PURE CULTURES OF EPITHELIUM

A pure strain of corneal epithelium was obtained in a culture made from the excised bulla of a case of bullous keratitis, kindly provided by Dr. Daniel B. Kirby. Growth developed (fig. 6) from all explants of this tissue, and consisted of pure epithelium without admixture of blood cells or fibroblasts. Epithelium free from fibroblasts was also obtained in

semifluid cultures in which the explants had become detached from the glass after epithelial growth had begun.

COMMENT

Of the three techniques outlined, the semifluid technique appears to be the one best adapted for the virus studies. It has the advantage over the fluid technique in that a much higher proportion of successful cultures are obtained, and is preferable to the plasma-clot technique in that the staining properties, particularly with the Giemsa stain, are much better. The Carrel D 3½ flasks are best for all ordinary work, since they allow examination with magnifications (with water-immersion lens) up to 900 times,

sufficient for most inclusion-body studies. When higher magnification is desirable, the Carrel microflasks are valuable, although they are less convenient to work with.

SUMMARY AND CONCLUSIONS

The cultivation of human conjunctival and corneal epithelium *in vitro* is reported, with notes on the histology of the developing tissues. A technique is described which is believed to be suitable for use in the study of such viruses as may require human epithelial tissues for propagation.

630 West One Hundred Sixty-Eighth Street.

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DISCUSSION

DR. DANIEL B. KIRBY, New York: I think that Dr. Thygeson is to be congratulated on the development of this method of cultivation of tissues from the human eye. Drs. Carrel and Ebeling have both spoken to me of their admiration of the progress which Dr. Thygeson has made in this research. I think it will be of further value in researches in cytology and in pathologic studies of other human-eye tissues. In 1927 Dr. Key gave me a specimen of an eye containing a melanosarcoma. I used a method by which the tissues were made to survive, and some of them multiplied in the process. The tissues survived for 10 days, and during that period it was possible to observe the characteristics of the various cells, and I believe that further research along these lines is possible.

Again I wish to congratulate Dr. Thygeson on his work.

DR. RAMON CASTROVIEJO, New York: I was particularly interested in the presentation of Dr. Thygeson, because he has brought out some points that had been the subject of debate. Dr. Thygeson has demonstrated that epithelial tissue cultivated *in vitro* gives origin only to epithelial tissue. In the same way, connective tissue can give origin only to connective-tissue cells.

In reviewing the literature on the histology of keratoplasty published by some French authors, I was surprised to find the statement that the connective-tissue cells developed in repairing corneal transplantation wounds originated from epithelial cells. This observation entirely disagrees with Dr. Thygeson's findings in cultivating tissue *in vitro*, and with my own microscopic study of corneal grafts, both in animals and in human beings. Like Dr. Thygeson, I found that

epithelial cells can reproduce only epithelial cells, and that connective-tissue cells were produced by preëxistent cells of the same nature.

Another point stressed by Dr. Thygeson in his article was that the growth of tissue cultures was the same whether the tissue was obtained from fetuses, stillborn infants, or adults. This observa-

tion also agrees with our clinical findings, in which corneal transplants obtained from stillborn infants acted in exactly the same manner as transplants obtained from adults' eyes.

Dr. Thygeson deserves to be congratulated for his very thorough and most interesting presentation.

TESTING FITNESS FOR NIGHT FLYING*

SPEED OF CHANGE OF ADJUSTMENT OF THE EYES FOR INTENSITY OF LIGHT AND DISTANCE OF OBJECT

C. E. FERREE, PH.D. AND G. RAND, PH.D.

Baltimore

As a part of the routine of night flying, the flyer must look back and forth from the comparatively highly illuminated cockpit and instrument panel to more distant outside objects under very low illumination. The ability to do this quickly and with a satisfactory discrimination of detail is, we are told, the most important visual qualification of a night flyer. It involves a change in the adjustment of the eyes for both intensity of light and distance of object. In other words, the night pilot has quickly to adapt from light to dark and back again to light as well as at the same time change his adjustment for distance from near to far and back again to near. The time required for this combined action in a suitable test relationship can be measured with an instrument which we have variously called a multiple-exposure tachistoscope, an oculomotor and accommodation tachometer, and an instrument for measuring the dynamic speed of vision, speed of accommodation, and ocular fatigue. Pictures of this instrument were shown in a previous article.¹ Since that

article was published, a new and much more convenient instrument, which we shall call a multiple-exposure electrical tachistoscope, has been designed and is now being manufactured by the Gaertner Scientific Corporation. Pictures of this instrument are given in figures 1 and 2.

The instrument comprises a timing mechanism and three shutters, electromagnetically operated, so arranged as to expose in immediate succession a near test object on the left, a far test object in the median plane, and a near test object on the right. The test objects are a letter E which can be rotated to four different positions to give an objective check on the judgment. The far test object is mounted in the same cabinet that contains the near test objects, the shutters, and the timing mechanism, as is shown in the sectioned side elevation (fig. 1). A front surfaced mirror that is mounted at an appropriate distance from the rear of the cabinet serves to reflect into the viewing slit the image of the far test object, thus reducing floor-space requirements. The distance of the far test object and the lateral separation of the two near test ob-

* From the Research Laboratory of Physiological Optics.

jects can be varied at will. Both the near and the far test objects are indirectly illuminated by a single long tubular lamp which is adjustably mounted so that the illumination of all the test objects may be equal or not, as the test conditions may require. The illumination of the front panel should be the same as that of the near test objects. Illuminations up to 10 ft-c. are readily available.

The shutters are mounted on light aluminum arms that are attached to the

the period of one revolution of the commutator (in the above case, 5 sec.). The commutator is driven by a 1/80 h.p. universal-governor-controlled D.C. motor with double worm-gear reduction. By varying the speed of the motor the commutator can be given a range of speeds from 6 to 30 r.p.m. The total duration of all the exposures can therefore be varied from 10 to 2 sec. At these limiting ranges the divisions on the dial will equal respectively 0.02 sec., and 0.004 sec. If still

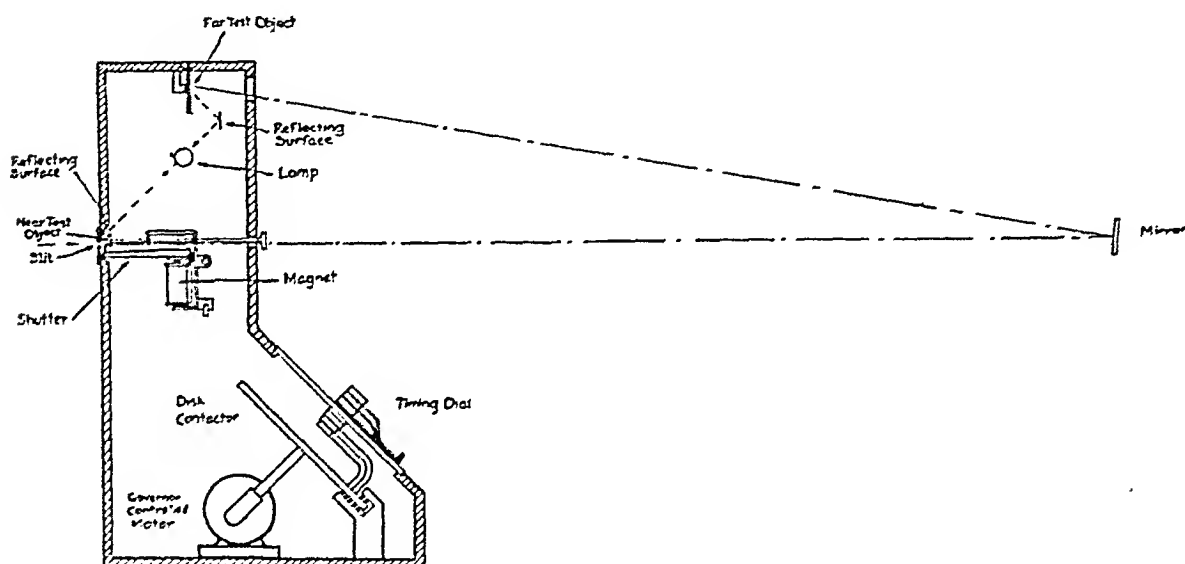


Fig. 1 (Ferree and Rand). Sectioned side elevation of multiple-exposure electrical tachistoscope showing the timing dial, the disk commutator, the motor, the exposure shutter and magnet, the viewing slit, the near test object, the far test object, and the lamp and the two reflectors for their illumination. The mirror is also shown in position for reflecting light from the far test object through the viewing slit of the cabinet.

armatures of three relays suitably positioned in the cabinet. The operate and release times of each relay are of the order of 0.005 sec. On the outside of the cabinet the necessary switches are provided and a timing dial the pointers of which contact a commutator. The dial has 500 divisions each one of which is equal to 0.01 sec. when the commutator rotates at 12 r.p.m. By setting the pointers at the correct position on the dial, the operator may vary the exposure time of any test object at will, provided that the total duration of all the exposures does not exceed

longer total exposure times should be required, this can be arranged for in the reduction gearing of the motor. When alternating current is used, a synchronous motor can be substituted for the governor-controlled motor and a rectifier inserted to convert the current supplied to the shutters.

This form of the instrument has been designed especially to give compactness of construction and the maximum convenience of operation.

The instrument makes possible: (a) the use of a set of very sensitive tests which

take into account as no other tests do both the motor and the sensory functions of the eyes in just the proportion that they occur in the act of seeing objects in different directions and at different distances, (b) the testing of the dynamic speed of vision with either the oculomotor or the accommodative feature emphasized, and (c) the measurement of the time required to change from near to far and from far to near in combination or separately.

tensity of light and distance of object. All that is required to make the additional measurement of speed of adjustment for change of intensity of light is obviously to illuminate the two near test objects to an intensity different from that of the far test object. The near test objects, for example, could be given an intensity similar to that illuminating the cockpit and instrument panel, and the far test object any suitable low intensity, preferably that approximating the outside illumina-

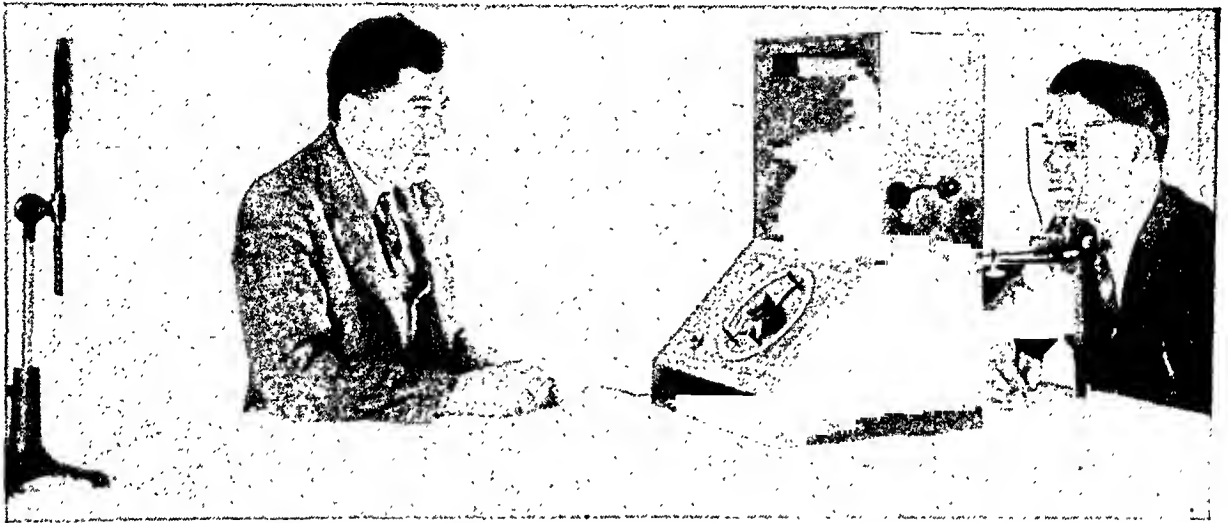


Fig. 2 (Ferree and Rand). The electrical tachistoscope in operation at a test station. The setup is for measuring speed of adjustment for change of distance of object.

The following practical uses of the instrument and test may be noted: (a) as a means of detecting abnormalities and depressions in the oculomotor functions in the work of the clinic, (b) as a test for vocational fitness in all cases in which dynamic speed of vision is an important requirement, (c) as a limiting test for age, (d) as a means of measuring ocular and oculomotor fatigue, also general fatigue, and the capacity to recover and (e) as a means of training eyes to greater oculomotor and accommodative facility.

It is the purpose of the present paper to recommend still another use of the instrument, namely, as indicated above, to measure the speed of change of adjustment of the eyes for both change of in-

tion at night. To make this test the instrument should be installed in a dark or darkened room. A small curtained enclosure should be provided, the back wall of which is the face of the instrument. The enclosure will simulate the cockpit and will be illuminated to an intensity suitable for a cockpit. In this the examinee will sit. The face of the instrument will, then, have the illumination of the cockpit, which illumination should also be given to the near test objects. The far test object as seen in the mirror should receive the low amount of light that is selected as representing that of objects outside the cockpit. The test will then be performed in the usual manner. The time will be measured to discriminate the near

test object and to change the adjustment from the near to the far test object and back again to the near, both with respect to adaptation and muscle control. For this test a much larger far test object will have to be used than is employed for measuring speed of adjustment for distance alone under medium intensities of light. In this respect it may be noted: (a) that small objects could not be seen with the intensity of illumination and time of exposure that are provided, (b) that the objects which the night pilot is required to discriminate outside the cockpit are in the main large objects, and (c) that the time he has to make the discrimination is usually short.

It may be noted further that the test situation presented by the instrument is extremely favorable for the control of the preliminary adaptation of the eye. That is, the observer is seated facing the exposure shutters and the front panel of the instrument, which receive the same intensity of light as falls on the near test objects.* Thus in the natural course of the experiment he can very easily and conveniently be adapted for any length of time that is desired to the same intensity of light at which the experiment begins and ends; namely, the intensity usually found in the cockpit and on the instrument panel. The near test objects could of course be given any value of illumination that is wanted, also the far test object; that is, any experiments or series of experiments involving differences in the intensity of illumination of the near and far test objects over a wide range could be performed. Since in the instrument described, the total exposure time may be varied in continuous series up to 10 sec. or

longer, the range of exposure times provided is ample for the purpose intended.

Obviously the test can be made in three ways: (a) The maximum performance for each person may be determined. This would be the analogue of making tests of visual acuity; for example, in terms of the minimum visual angle that can be discriminated. This procedure is the longest because it requires a correct adjustment of the exposure times for each observer, but it results in a much finer grading of performance. (b) Any suitable number of levels of performance may be chosen and the instrument set at once to give these levels. This method of testing would place persons in ranks or groups and is the analogue of the Snellen method of grading visual acuity. It is a quicker procedure than (a) but the grading is correspondingly rough. By a practiced examiner, testing by this method should take but a few minutes. In forming such a graded scale in our preliminary work with the instrument in general,² we used steps of 0.02 sec. for the double excursion. These intervals have been found very suitable by Comdr. C. J. Robertson (M.C.), U.S.N., in his work with the instrument in classifying aviators as to fitness of performance for day flying.⁴ An alternate procedure would be to determine directly specific scales made up of the number and breadth of steps needed for the purpose in question. (c) Critical or limiting values could be established for any purpose for which such values are desired. The instrument could then be set for these values after the usual preliminary trials to familiarize the examinee with the test, and the determination made whether he could give the judgments required, which could be done with a single setting of the dials of the instrument.

The aforementioned three procedures are for a given intensity of light and given distances of the near and far test objects.

* A convenient means of illuminating the exposure shutters and the front panel of the instrument and of varying the intensity of illumination over a wide range as may be desired, is the device we have called a variable illuminator.²

The test can be varied indefinitely by changing these intensities and distances.

As stated in the beginning, the task set in this form of the test closely approximates that set for the night pilot in his routine performances—more closely than is the case, for example, in the tests recommended in two former papers;⁵ namely, the determination of the light minimum and of the light minimum for the discrimination of detail. These were tests only of important general functions, not specific tests for particular performances; while in the new test made possible by the tachistoscope we have not only a scientific test of capacity, within the limits considered, but a specific performance test made under scientific conditions with accurate scientific controls. We call this a specific performance test because the actual visual task which the pilot has to perform in night flying is very closely copied. In this test his ability to make a quick adjustment for both change of distance of object and change of intensity of light is accurately measured. The time required for the change of adjustment for intensity of light of the order required here (the adaptation-time) is much more accurately measured, for example, than is possible with any adaptometer that has yet been devised. Only those who have done work on adaptation can appreciate how neat, quick, and perfect a way this instrument provides for measuring speed of adaptation. Light adaptation, for example, takes place so quickly that it is very difficult to measure it accurately with an adaptometer.

It may be stated further that the instrument employed also serves a very important purpose in the general testing program for aviators, as indicated earlier in this paper and in former papers^{1,3} and as has been shown in the extremely interesting and valuable studies made by Dr. Robertson⁴ on the visual and oculomotor

fitness for aviation and on the ocular and general fatigue induced in aviators. It is felt that further details with regard to the instrument and its uses are not needed here because of these previous papers by Dr. Robertson and by us in which full information is given.

SUMMARY

As a part of the routine of night flying, the pilot must look back and forth from the comparatively highly illuminated cockpit and instrument panel to more distant outside objects under very low illumination. The ability to do this quickly and with a satisfactory discrimination of detail is perhaps the most important visual qualification of a night pilot. It involves a change in the adjustment of the eyes for both intensity of light and distance of object. The night flyer has quickly to adapt from light to dark and back again to light as well as at the same time change his adjustment for distance from near to far and back again to near. The time required for this combined action in a suitable test relationship can be measured with the instrument and test method described in this paper.

The task set by the method described closely approximates that set for the night flyer in his routine performances, more closely than is the case, for example, in the tests recommended in two former papers; namely, the light minimum and the light minimum for the discrimination of detail. These were tests only of important general functions, not specific tests for particular performances. The present test is not only a scientific test of capacity but a specific performance test made under scientific conditions with accurate scientific controls. Speed of adjustment for change of distance of object and change of intensity of light is accurately measured—that for change of intensity of light (speed of adaptation)

much more accurately than is possible, for example, with any adaptometer that has yet been devised.

The instrument described also serves a very important purpose in the general

testing program for aviators and for testing ocular and general fatigue. Still further uses of the instrument are noted in the paper.

2609 Poplar Drive.

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NOTES, CASES, INSTRUMENTS

NEUROMYELITIS OPTICA

REPORT OF A CASE RESULTING IN BILATERAL TOTAL BLINDNESS

HUGH C. DONAHUE, M.D.
Boston

A careful review of the literature reveals the fact that the syndrome usually recognized as acute retrobulbar neuritis—that is, an affection of the papillomacular bundle at any point along the second neuron and characterized by: first, an acute onset; second, unilateral incidence; third, central scotoma; and fourth, a tendency to recover—is a very common finding. The occurrence, however, of a lesion involving both second nerves with permanent loss of vision is extremely rare and therefore worthy of report.

In searching for the etiological factor in the reported cases of retrobulbar neuritis one is impressed by the tremendous variety of causes listed; almost every systemic disease as well as localized inflammations and toxic influences has been blamed for the ocular pathology. Some of the causes cited are syphilis, tuberculosis, arteriosclerosis, multiple sclerosis, encephalitis, diabetes, avitaminosis, neoplasm, typhoid fever, sinusitis, herpes zoster, alcoholism, thallium therapy, and many others.

Jaeger in 1931 reported a few cases of retrobulbar neuritis with marked loss of vision following influenza; he stated that these cases showed definite nerve atrophy followed by restoration of good vision. Uthoff, one of the first thorough students of ocular signs in multiple sclerosis, claims that 75 percent of retrobulbar neuritis is caused by multiple sclerosis, while other estimates range down to 28 percent.

Obviously the etiology of this syndrome, as gleaned from the literature of

the past 20 years, is multiple and varied. Only 14 cases of acute bilateral retrobulbar neuritis were found in the reports of these years. These were cited by Charlin in 1936: of these, 12 of the patients were between the ages of 25 to 50 years, and two under this age; males were affected more than females in the ratio of ten to four. First one eye became blind, then the other followed speedily; pupils were dilated and fixed to light. During the first two weeks a mild swelling of the disc occurred in all cases, followed by pallor and restoration of vision. The author does not state how much vision was regained nor does he state the etiology of the cases, although implying that they were of influenzal origin or due to infection in the accessory nasal sinuses.

In a personal communication, Dr. V. Casten, of Boston, states that he has had five cases of acute bilateral retrobulbar neuritis in private practice during the past six years. The patients remained permanently blind and all were elderly people. There were no accompanying neurological signs, and the etiology was probably not of an infectious nature.

However, in contradistinction to this type of case, Allbutt in 1870, Achard and Guinan in 1889, and Devic in 1894 described a clinical entity in which there occurred massive demyelination of both optic nerves combined with the same type of lesion in the spinal cord, usually occurring in the lower cervical or upper dorsal regions, and to which the name neuromyelitis optica was given.

The pathology involved is an extensive demyelination of the nerve tissue with small areas of rarefaction in which the axis cylinders are also destroyed. There occurs marked perivascular infiltration of round and mononuclear cells

in the demyelinated areas, many of the cells being neurologic astrocytes.

This type of pathological change occurs, as has been said, in any part of each optic nerve in combination with the same type of lesion in the spinal cord, and it is to this group of cases that I wish to add my own case report. It is obvious that the amount of vision that will be regained by the patient will depend upon the amount of destruction caused by the inflammatory process within the optic-nerve tissue and will probably vary in every case. In previous case reports I have not been able to discover one case in which total blindness resulted, but because of the severe and extensive destruction of nerve tissue that occurred in my case, permanent blindness has ensued.

Case Report: W. F., a white, American, male, insurance agent, aged 34 years, was seen on January 12, 1938, at 11:00 p.m. He had suddenly lost the vision in both eyes, eight to nine hours previously. There had been a dull, nonradiating frontal type of headache during the previous few hours, but otherwise the patient had had no symptoms.

During the previous 10 days he had been treated by his local physician for a condition that was diagnosed as influenza. During this period of treatment he had received approximately 25 to 30 grains of sulfanilamide daily, and during the past two days had been up and about and tending to his work.

Examination upon January 12, 1938, revealed the vision in both eyes to be nil. There was moderate orbital pain upon movement of the eyeballs in any direction and slight pain upon pressure upon each globe. The lids, conjunctiva, corneae, lacrimal apparatus, and muscular excursions were normal. There was no congestion of either eye. The pupils were moderately dilated, about 5 mm. in size, and fixed to light and accommodation. The

media of each eye were clear. Both optic-nerve heads were blurred with complete obscuration of outline. There were diffuse scattered hemorrhages over each papilla and over the peripapillary retina of each fundus, which area was edematous and ischemic. The veins were tremendously engorged and tortuous and the arteries were slightly constricted. A diagnosis of acute bilateral retrobulbar neuritis was made and the patient was immediately hospitalized.

Upon closer investigation of the past history no association with alcohol, drugs, lead, or serum could be elicited. The patient smoked about 30 cigarettes daily and was on a fairly well-balanced diet.

The eye condition remained unchanged during the next 48 hours and during this time the patient was seen by a neurologist. There were no clinical signs of additional neurological involvement at this time, but examination of the spinal fluid revealed the presence of 110 lymphocytes and 10 mononuclear cells; the total protein content of the spinal fluid was elevated to 45 mg. per 100 c.c. Roentgenograms of the skull and sella turcica were normal; the sinuses were negative. No other abnormal findings were found upon complete laboratory and clinical studies.

As most cases of retrobulbar neuritis that are not due to multiple-sclerosis have no abnormality of the cerebrospinal fluid, the patient was kept under careful observation by the neurological consultant, and daily lumbar punctures were made. The number of cells present in the spinal fluid continued to remain exceptionally high, varying from 70 to 120 in number, largely lymphocytes in type.

Upon the fourth day after admission to the hospital, the patient developed a motor-sensory paralysis of the bladder, with moderate distension and inability to void. The patient was placed upon tidal drainage upon the sixth day following

admission and regained no bladder function during the ensuing four days. During this time the optic-nerve heads became slightly less blurred, with some diminution in engorgement of the retinal veins. There was no improvement in vision nor in pupillary reactions.

Approximately 15 days after admission, during which time there had been complete paralysis of the motor and sensory function of the bladder for 11 days, the patient began to regain some sensation and function of the bladder, which increased comparatively rapidly. Upon the eighteenth day of his hospital stay, he had regained completely both motor and sensory bladder function, although there had been absolutely no change in the visual acuity. He was discharged on the next day (nineteenth day of hospitalization), the vision being nil in each eye.

He was seen again in my office one week later. There was marked recession in the amount of papillitis with a beginning pallor of the nerve heads. The veins were slightly distended and absorption of the retinal hemorrhages had taken place.

The patient was again seen one month later and was perfectly well physically but there was no change in his vision, which was nil in each eye; the pupils were moderately dilated and fixed. The optic-nerve heads were snow-white with a very small amount of new vessel formation about each nerve head, and the blood vessels had regained their normal size and shape.

This case demonstrates the course of an acute fulminating infection causing extensive destruction of the tissue of both second cranial nerves, which was accompanied by a lesion in the spinal cord that temporarily paralyzed the motor and sensory bladder function. The process in both cranial nerves was so extensive and severe as to produce permanent blindness; whereas the accompanying process in the

spinal cord was of a milder nature, and complete recovery took place. The etiology is supposedly a virus infection.

520 Commonwealth Avenue

GUMMA OF THE OPTIC PAPILLA*

A CASE REPORT

RAPHAEL KOFF, M.D.

Longview, Texas

Few ophthalmologists have seen a gumma of the optic papilla, which is rather surprising in view of the frequency with which the optic nerve is involved in lues. Less than 20 cases are reported in the literature; however, such a possibility should be considered in any differ-

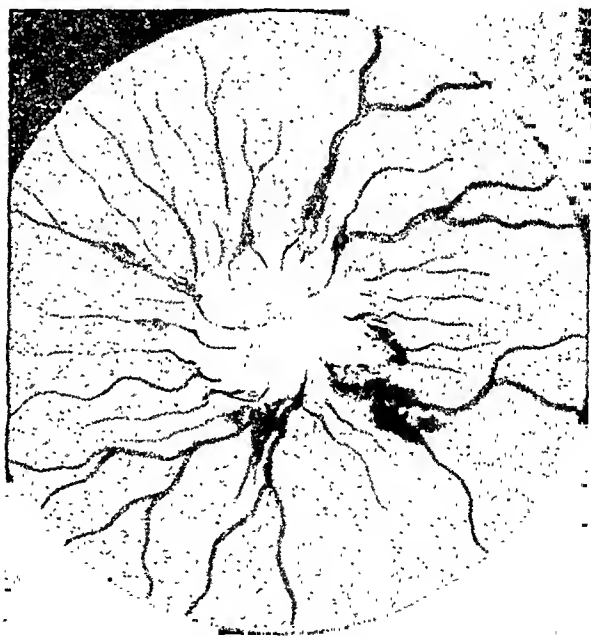


Fig. 1 (Koff). Gumma of optic papilla (from Kumagai).

ential diagnosis of neoplasm of the papilla. According to Schieck-Brückner, the ophthalmoscopic picture is somewhat variable, "occasionally reminding one of a tumor; generally, however, giving the impression of a choked disc (fig. 1), often enough obscured by a clouding of

* From the service of Dr. L. G. Hoffman, Illinois Eye and Ear Infirmary, Chicago.

the vitreous." Dimmer speaks of the tumor as cauliflowerlike, which fits the present case exactly. Frequent concomitant signs are an anterior uveitis, yellowish dots in the periphery of the fundus, and flame-shaped hemorrhages around the disc. Any or all of these may be present.

The ophthalmoscopic picture in this case is shown in figure 2 (printed from a



Fig. 2 (Koff). Ophthalmoscopic view of gumma of the optic papilla.

Kodachrome transparency by Dr. Robert von der Heydt), though necessarily a nonstereoscopic view does not fully demonstrate that this tumor projected forward into the vitreous for about five diopters. The figure shows clearly the atrophic portion of the retina adjoining the tumor and the high-grade perivascular sheathing which extended into the periphery of the fundus.

The tumor in this case was a glistening yellowish-gray, about $1\frac{1}{2}$ D.D. in diameter, with a raspberry-like surface. It covered the lower temporal one third of the nerve head. The vessels coursed directly over it. The remaining visible portion of optic nerve was pale white with fuzzy borders. In the center of the gray atrophic portion of the retina about the tumor was a pink spot demarcating the macular area.

The patient was a known paretic with a four-plus blood Wassermann and spinal-fluid reaction. He had had tryparsamide and bismuth therapy at the Elgin State Hospital for the Insane. For about $1\frac{1}{2}$ years preceding admission to the Illinois Eye and Ear Infirmary his vision had been failing but with no signs or symptoms of anterior-segment inflammation. There was no light perception in the eye with the gumma; the other eye had an optic atrophy with a corrected vision of 20/30 and a field as shown in figure 3. Slitlamp and other ocular examinations were negative, as was the general physical examination, except for luetic involvement of the nasal septum.

Differential diagnosis rests upon (1) serology of the blood and spinal fluid, (2) frequently associated inflammation

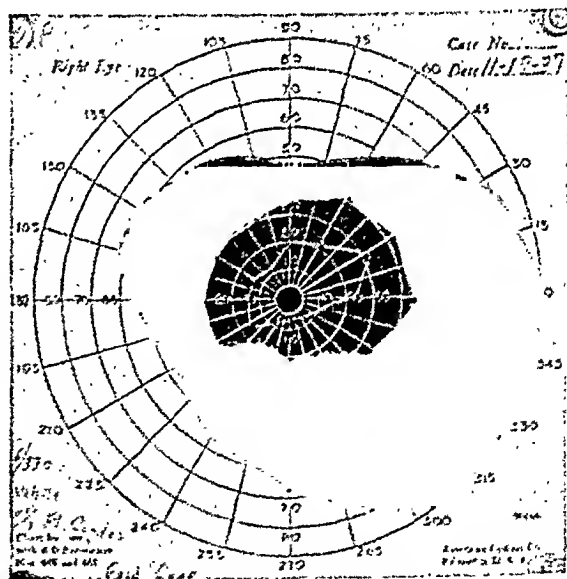


Fig. 3 (Koff). Visual field.

of the anterior segment, (3) above all the response to antiluetic therapy, the lesions regressing markedly and rapidly.

The functional prognosis is doubtful; some eyes may regain normal vision under strenuous antiluetic therapy, while others go on inexorably to total blindness.

Though there could be no histological

studies here, several of the reported cases have been verified by section (cf. Juler, Waggoner, Stock, Parsons, and Verhoeff). Verhoeff was able to demonstrate spirochetes in his case. The pathological basis of the lesion is a massive inflammatory process in the interior of the papilla with more or less necrosis. The

gumma is commonly considered a lesion of tertiary syphilis, but in the optic nerve they may occur as early as three months after initial infection. Some have been observed while the skin manifestations of secondary lues were still present. Details of the reported cases can be found in the original articles listed in the bibliography.

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OPHTHALMOLOGICAL REQUIREMENTS FOR EMPLOYMENT— 1939

DAVID D. WAUGH, M.D.
Brooklyn, New York

This material was compiled from circulars and letters received from various agencies, during the year. It has been arbitrarily limited for the sake of brevity.

United States Army, National Guard, and Organized Reserves (A. R. 40-105 and Circ. 74).*

Enlistment. 20/100 vision in each eye, 20/40 in one with glasses; no organic disease.

Commission. Army. 20/40 vision in each eye, 20/20 in one with glasses, ability to distinguish and identify red and green; no organic disease. *Medical and Chaplain.* 20/200 vision in each eye, 20/20 in one

with glasses, if myopic; 20/50 in each eye, 20/20 in one with glasses, if hyperopic. Ability to distinguish and identify red and green; no organic disease. *National Guard, and Organized Reserves.* 20/200 vision in each eye, 20/20 in one with glasses. Ability to distinguish and identify red and green; no organic disease.

Standards for Flying (A.R. 40-110). Class #1, applicants, those in training, rated pilots, and combat observers. Class #2, rated pilots, and combat observers not meeting the standards of class #1, if permitted by Chief of Air Corps. Class #3, rated command pilots and technical observers.

Visual acuity: Class #1, 20/20 in each eye, without glasses. Class #2, 20/40 in each eye, 20/20 in each eye with glasses while flying. Class #3, 20/100 in each eye, 20/20 in each eye with glasses while flying.

Depth perception at six meters: Class #1, 30 mm. or less. Class #2, 35 mm.

*Data in parentheses indicate the official number or title of the publication from which this information was compiled.

or less, with glasses. Class #3, command pilots only, 35 mm. or less.

Heterophoria at six meters: Classes #1 and #2, esophoria of 10^a or less. Esophoria of 4^a or less with prism divergence of less than 4^a. Exophoria of 5^a or less. Hyperphoria of 1.0^a or less. Class #3, esophoria of 12^a or less; exophoria of 7^a or less. Hyperphoria of 2^a or less. Any heterotropia for all classes.

Power of divergence: Classes #1 and #2 only. Divergence must equal or exceed esophoria not more than 15^a or less than 3^a.

Red-lens test: Classes #1 and #2. Diplopia at 50 cm. or more. Command pilots, diplopia at 27.30 cm. or more.

Inspection of the eyes and ophthalmoscopy: No permanent defect interfering with function.

Accommodation: Class #1, not more than 3 diopters below mean for age, or total of less than 6.5 diopters. Class #2, not less than 3 diopters. Classes #2 and #3, no restrictions if, while flying, near correction is worn that gives normal vision at 50 cm.

Angle of convergence:

$$\frac{1/2 \text{ Pd} \times 100}{\text{PcB}} + 3$$

(Pd = pupillary distance; PcB = near point of convergence.)

Classes #1 and #2, angle of convergence of 40 degrees or more.

Central color vision: Normal.

Field of vision for form: Normal for 3 mm. white test object at 33 cm.

Refraction: 1.5 diopters or less in any meridian, or cylinder of 0.5 or less, with cycloplegia.

United States Military Academy (Circular of Information).

20/20 vision in each eye without glasses; no organic disease; total hyper-

opia of 2^a in any meridian; esophoria of 10^a or less; exophoria of 5^a or less; hyperphoria of 1^a or less; and fair color sense.

United States Navy (Regulations).

Enlistment. 15/20 vision in each eye, 20/20 with glasses, normal color vision; no organic disease.

Commission. 18/20 vision in each eye, 20/20 with glasses, or when myopia or myopic astigmatism is present, normal color sense; no organic disease. *Staff Corps.* 12/20 vision in each eye, 20/20 with glasses, normal color sense; no organic disease. *Supply and civil engineers.* 15/20 vision in each eye, 20/20 with glasses, normal color sense; no organic disease.

United States Marine Corps.

Same as the Navy.

United States Naval Academy (Regulations).

20/20 vision in each eye without glasses, no myopia or myopic astigmatism; no organic disease; normal color vision. During service and at graduation, 18/20 in each eye without glasses and 20/20 without glasses when due to myopia or myopic astigmatism. Entrance examination under cycloplegia.

United States Department of Commerce.

Civil Air Regulations (20 and 21).

Student, solo and private pilot. 20/50 vision in each eye, or 20/30 with glasses, depth perception 30 mm. or less, no diplopia or serious pathology.

Limited commercial, commercial, and airline. 20/20 vision in each eye without glasses, depth perception 30 mm. or less, no diplopia, normal muscle status with abduction of 3^a or more,

normal accommodation and fields of vision, no pathology, hyperphoria less than one.

Steamboat Inspection Service (801-A).

Master, mate and pilot. Certificate of visual competency and normal color sense. For renewal or raise in grade, normal color sense unless limited to daylight service.

Engincer. Certificate of visual competency.

United States Civil Service Commission.

Stenographers, typists and clerical workers (2313); *bacteriologist* (72), *elevator conductor* (18), *printer-proof reader* (22), and *customs examiner's aid* (27). 20/200 vision in one eye, 20/30 with glasses. Customs examiner's aid to have normal color sense.

Nurses (26, 27, 28, 68, 13, and 51). 20/40 vision in one eye, 20/70 in the other; with glasses, 20/30 in one eye, and 20/40 in the other.

Warders (20), *park rangers* (23), *stewards* (34), *cooks* (94), and *farm managers* (50). 20/40 vision combined, 20/50 in the weaker, without glasses.

Safety instructors (65), and *junior refuge managers* (84). 20/40 vision in each eye without glasses.

Marine surveyor (70). 20/30 vision in one eye, 20/200 in the other with glasses.

Assistant and associate refuge managers (85). 20/200 vision in each eye, 20/40 in each with glasses.

Student finger-print classifier (9). 20/30 vision in each eye, 20/20 in each eye with glasses, normal accommodation, normal color vision; no pathology.

Policeman (21). 20/30 vision in each eye, 20/20 binocularly, without glasses, normal color sense, and no pathology.

Marketing specialist (33), *inspector of clothing* (34), and *poultry inspector* (43). Normal color vision.

New York State Civil Service Commission.

Court attendant. Average 20/30 vision in both eyes, 20/40 in the weaker, with glasses.

Prison guard (79). 20/40 vision in each eye without glasses.

Patrolman (109, 73, 63, and 222). 20/40 vision in each eye without glasses.

Game protector (124). Tests for eyesight may be required.

Clerical. None.

Nurses. None.

New York City Civil Service Commission.

Clerical. 20/40 vision in one eye with glasses.

Skilled and unskilled labor. 20/40 vision in one eye with glasses, vision in the other.

Subway system. 20/40 or 20/30 vision in each eye, depending on the position. Glasses allowed, except for conductor, towerman, and yardmaster.

Prison keeper and auto truck driver. 20/30 vision in each eye, without glasses.

Life guard. 20/30 vision, both eyes together, without glasses. Vision in both.

Court and other attendants. 20/30 vision in each eye, with glasses.

Policemen and firemen. 20/20 vision in each eye, without glasses.

New York State Troopers.

20/20 vision in each eye without glasses.

New York State Motor Vehicle Bureau.

Operator and chauffeur. 20/40 vision in each eye with glasses.

Civilian Conservation Corps.

20/200 vision in each eye, 20/40 in one with glasses; no organic diseases.

253 Cumberland Street.

SOCIETY PROCEEDINGS

Edited by DR. H. ROMMEL HILDRETH

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

SECTION ON OPHTHALMOLOGY

April 8, 1938

DR. WALTER CAMP, *president*

DRY EYES

DR. C. WILBUR RUCKER of Rochester, gave a talk on this subject.

Discussion. Dr. Virgil Schwartz said that most of us have not seen much of this condition. He was interested to know if Dr. Rucker has any idea as to whether or not there is a connection between this and xerophthalmia. He said nothing regarding the possible cause of the trouble except in one instance, a history of generalized glandular inflammation. Does avitaminosis play any part in this condition?

Dr. F. N. Knapp, Duluth, reported that in a recent meeting at Cairo, Ida Mann was discussing cases of keratitis in ex-service men. These patients suffer from recurrent attacks after trench-gas burns. No treatment gave much relief until she began using a contact glass. With the use of the contact glass the corneal lesions are relieved rapidly and the pain and discomfort were alleviated.

Dr. A. D. McCannel, Minot, North Dakota, stated that he had had very little experience with this type of case, but he recalled one case similar to this. The patient had a marked photophobia, with small punctate areas of staining over the entire cornea. He treated the patient over a period of two years, at intervals of about three months. She was given palliative treatment, mild mercurials, diounin, and the trouble would clear up. In about three months she would be back again, with the same symptoms. After this had

occurred several times, he advised her to seek further consultation, which she did, with practically the same results as before. Finally, she consulted an old doctor whom many of us knew in those days. He injected her upper lid, which gave her immediate relief, and she had no recurrence for a period of eight years.

Dr. Charles N. Spratt suggested that the keratitis in these dry eyes might be due to the absence of lysozymes. The protective action of this substance was demonstrated many years ago by Ridley. Lysozymes play an important role in protecting the cornea from infections.

Dr. Charles Hymes asked Dr. Rucker if he found evidence of mild iritis associated with filamentary keratitis and if the punctate keratitis of the limbus seen in elderly people is in any way associated with lack of sufficient tears. The fact that punctate keratitis of the limbus of the cornea clears up rather promptly after cauterization would indicate that an insufficiency of tears is probably not a factor.

Dr. Rucker in closing said that the keratitis sicca that he had described is not the same as early xerophthalmia, as suggested by Dr. Schwartz. When there is a deficiency of vitamin A, a keratinization of the corneal epithelium occurs and a hyalization of the superficial layers of the stroma tissue along with the dryness of the conjunctiva and the appearance of Bitot's spots. In the picture he described there were merely punctate ulcers on the cornea and small strands of epithelial filaments. Sjögren has shown that in a number of cases studied the sections of lacrimal glands showed evidence of a previous inflammation that had destroyed the gland cells and had replaced them with connective tissue. He

had not used a contact glass in treating any of these patients. As far as he knows there is no evidence that this clinical entity of dry eyes is caused by a deficiency of lysozymes in the tears, as suggested by Dr. Spratt. Neither is this disease related to the corneal ulcers appearing at the peripheral portions of the cornea in old people, as suggested by Dr. Hymes. As stated, these ulcers clear rather promptly after cauterization and treatment of the accompanying conjunctivitis. Such treatment is of no avail in the cases of dry eyes.

DIVERGENCE INSUFFICIENCY

DR. A. D. PRANGEN, Rochester, presented a paper on this subject which was published in the May, 1938 issue of this Journal.

Discussion. Dr. Koch of Rochester said that the following remarks, as would be noted, necessarily were rather categorical and assumptive. The question of the existence of divergence as an active ocular function rather than as one of passivity had been discussed only infrequently in the literature. Bruce, in the Archives of Ophthalmology in April, 1935, offered an excellent review of this subject.

It must be granted that active divergence must exist in some degree if convergence is to be of biologic value. Normally, the two functions of convergence and divergence are antagonistic and one may assume, therefore, their phylogenetically simultaneous appearance, since nature tends to preserve and accentuate biologic assets.

As the eyes moved forward, phyletically, the visual fields overlapped and binocular stereoscopic vision ultimately developed. Points at varying distances can be focused by the visual axes in true fusion and both convergence and divergence are each in turn indispensable to this ability. If divergence is accepted as a function of importance and not as a

mere factor in the ocular mechanism, there must exist a center to control its activity.

The center for convergence in the nucleus of Perlia is well established and is the last known center to have been differentiated in the phylum. It is difficult to believe that this very important center is without its physiologic antagonist, especially when one considers the phylogenetic development of convergence and its importance to fusion. By deduction, therefore, divergence must have appeared approximately coincident with convergence.

With the eyes in a state of convergence, lateral divergence can be accomplished only by two means—elasticity, and by contraction of the external rectus muscles. Elasticity accounts for very little of this divergence, the action probably taking place chiefly through the innervation of the external recti from the abducens nuclei or from some other source, supposedly, the nucleus for divergence.

The most positive evidence in favor of the existence of a divergence center is obtained from the study of the recognized clinical entity of paralysis of divergence. As Bruce has emphasized, the lesion would necessarily be in the cortex, the paths below the cortex, or in a divergence nucleus. Its location in one or both of the first two situations, however, would be of such extent as to cause marked prostration or even death; certainly, symptoms other than those of paralysis of divergence alone would predominate. Thus, the only situation left to be occupied by a lesion that would produce the picture of simple paralysis of divergence is the divergence center or nucleus.

Further confirmation is obtained from the fact that the abducens nucleus is unaffected in pure divergence paralysis but may become involved later, as in encephalitis, and produce true abducens-

nerve paralysis. Thus, from the foregoing, it is possible to assume that the abducens nerve regulates (in a sense) the function of divergence, making possible the postulation of a center for divergence separate from, but adjacent to, the nucleus of the abducens nerve. And, since the external rectus muscles are innervated ipsilaterally, this nucleus for divergence would probably lie in the midline above the nucleus of the abducens and the nucleus of Perlia.

Dr. Walter Fink of Minneapolis said that they were indebted to Dr. Prangen for bringing this subject to their attention, as these cases are not only interesting but that his presentation stressed also the importance of a thorough analysis of muscle cases. He believed that insufficiency of divergence, like divergence excess, to be uncommon, probably less than 1 percent.

It was his impression that cases of this nature, over a period of time develop convergence excess as a secondary complication. It is only by being on the lookout for it that cases of moderate degree can be recognized. Incorrect diagnosis may be made, and incorrect treatment in the form of muscle exercise may be given which will aggravate the condition.

In treating situations of this type it has been his custom to attempt to develop divergence by base-in exercise or the use of stereoscopic cards made by the Keystone Company. It has been his experience in using prisms that the amount of prism must be increased, and he has discontinued using them.

Dr. Hendrie W. Grant, St. Paul, said that in considering the subject of divergence insufficiency and convergent squint for distance alone, he believed one very important factor should be stressed; that is, the differentiation between an intermittent squint and a true phoria. With strabismus at one distance and phoria at another, changes may eventually take

place in the muscle to produce strabismus to both distances; that is, far and near. Ordinarily, such convergent squint which is present for distance alone, and not for near, develops in the latter years of childhood when the tendency of the position of rest is esophoria. It has not been his experience that either children or adults can overcome a large amount of esophoria for distance without double vision, and that, ordinarily, four prism diopters of prism divergence is necessary to prevent double vision. Most of the individuals with this condition who have difficulty with close work have some involvement of the near point also from a constant squint. In older persons, disturbances which produce an esophoria for distance are essentially innervational and respond well to correction with prisms, and most satisfactorily so when the prism divergence can be increased to four diopters. He could see no reason why prisms should not be prescribed for individuals for whom this type of phoria develops late in life.

Dr. Prangen in closing said it is difficult, in a way, to see why the wearing of prisms, base out, particularly in both distance and near vision, should be of benefit in these cases. He believes the answer, however, is as Dr. Grant pointed out, that our discussion is limited to that definite group of older people who have an innervational type of disturbance exhibiting itself by a definite deficiency in the divergence mechanism. In these, in our experience, the use of the minimum amount of prism, base out, worn constantly has been of benefit.

Dr. Wheeler asked whether the use of atropinization and added plus lens in near vision would be of benefit in these cases of divergence insufficiency. In our experience, these were of no benefit except that therapeutic cycloplegia was of transient help in putting the eyes at rest but

did not alter the amount of esophoria exhibited.

In answer to Dr. O'Reilly, the question as to whether the nervous irritability exhibited by these people was the cause of the eye difficulty, or vice versa, we have been unable to determine which is the primary cause, the nervous instability or the ocular pathology.

George E. McGeary,
Secretary.

CHICAGO OPHTHALMOLOGICAL SOCIETY

May 9, 1938

DR. THOMAS D. ALLEN, *president*

IRIDOCYCLITIS WITH SECONDARY GLAUCOMA

DR. ROBERT FITZGERALD presented a Negro aged 21 years, who entered the hospital on October 11, 1937, with a severe attack of acute iridocyclitis and secondary glaucoma of the right eye of two-weeks' duration. The intraocular tension was above 80 mm. Hg (Schiötz). There was severe pain and the vision of the affected eye was reduced to ability to count fingers at 12 inches. The left eye was normal at this time, with visual acuity of 20/15. Following miotic therapy, combined with limbal paracentesis and subsequent daily drainage of the anterior chamber by reopening the wound, the hypertension was completely relieved and the anterior uveitis subsided. History and examination revealed only a chronic suppurative prostatitis said to be of two-years' duration, which followed an acute gonorrheal urethritis. No evidence of syphilis was found; the serology of the blood and the spinal fluid was negative, even after provocative arsenical injections. Tuberculin tests were negative and there was no clinical nor roentgenologic evidence of tuberculosis. No foci of in-

fection were found in the teeth, tonsils, or nasal sinuses.

About five weeks after admission therapeutic massage of the prostate was started. After the initial massage, the right eye promptly developed a recrudescence of the anterior uveitis, without hypertension, and also a deep infiltration of the central portion of the cornea, followed by deep vascularization. The left eye developed an acute anterior uveitis, followed about four weeks later by a similar parenchymatous keratitis. During a period of some six months of treatment, the corneae have cleared until the vision has improved to R.E. 20/50, L.E. 20/40. No further signs of active prostatitis remain. Each prostatic massage was followed by temporary increase of ocular pain and blurring of vision.

The suggestion was made that in similar cases prostatic massage should not be too vigorously nor frequently applied. There were similar occurrences in two other patients with iridocyclitis due to prostatitis, who were under observation and treatment at the same time. Within 24 hours after vigorous prostatic massage, one patient developed marked exacerbation of the iritis with spontaneous hyphema; the second patient developed severe iritis in the previously unaffected other eye.

CONJUNCTIVAL TUMOR

DR. ROBERT FITZGERALD said the second patient, a Negro aged 55 years, entered the hospital on February 16, 1938, with a massive infiltration and tumefaction of the conjunctiva of the right eye which had been developing for two years, preceded for one year by secretion and redness without noticeable swelling. There was irregular nodular infiltration of this enormously tumefied conjunctiva, with several areas of ulceration. The upper and lower lids were overridden en-

tirely by the conjunctival mass, which extended upward to the eyebrow level, temporally well beyond the outer canthus, and downward to the lower margin of the orbit. The infiltrated conjunctiva was so tense that it could not be retracted upward as far as the margin of the lower lid. There was a deep lagophthalmic marginal corneal ulcer near the lower limbus. The Wassermann and Kahn tests on the blood serum were strongly positive, but the spinal-fluid serology was negative. On three occasions segments of the infiltrated conjunctival tissue were removed for biopsy and each time the pathologist reported tuberculous granulation tissue. Smears were examined repeatedly, with one finding of acid-fast rods resembling tubercle bacilli, but guinea-pig inoculation was negative.

The patient was placed on antisyphilitic therapy, daily mercurial-ointment inunction and potassium iodide. The conjunctiva was irrigated with 2-percent urea solution. Under this treatment improvement was rapid and at the end of five weeks the clinical cure was complete.

HUGHES OPERATION FOR PLASTIC CORRECTION OF LARGE DEFECTS OF THE LOWER LID

DR. W. F. MONCRIEFF said that three cases were presented to demonstrate the first stage of this operation. The first patient had a large flat condylomatous tumor mass with dark hemorrhagic crusted surface involving the outer two thirds of the left lower lid, extending downward from the lid margin to below the inferior margin of the tarsus. Histologic examination revealed a prickle-cell carcinoma. This had been present for six weeks prior to admission to the hospital. The tumor was removed surgically and plastic repair was made by means of the Hughes operation.

The second patient had a carcinoma

involving the right lower lid, of six-years' duration. Following radium therapy three years previously, a slough of the entire lower lid occurred. Two attempts at plastic repair one year later were unsuccessful. At the time the present surgery was performed there was complete loss of the right lower lid with deep scarring and fixation of surface tissues to the lower rim of the orbit. The patient was shown about five weeks after the first stage of the Hughes operation had been performed.

The third patient had a carcinoma of three-years' duration, which involved the left lower lid. Despite rather large doses of radium administered intermittently over this period, the lesion continued to progress. The tumor involved the entire length of the left lower lid with a large ulcerated area in the midportion of the lid margin. About five weeks prior to this meeting, the entire area was resected and plastic repair by means of the Hughes operation was initiated.

These cases will be shown at a future meeting when the procedure is completed.

Discussion. Dr. Sanford Gifford said, with reference to the Hughes plastic operation, that several things not mentioned by Hughes in his article, have been learned. If his directions as to suture of the mucous membrane to the skin were followed, it was found that the conjunctiva was too short and that it turned the skin in with the lashes. In the second of the three cases shown, the conjunctiva was not sutured to the skin in the middle, but only a couple of stitches were inserted near the inner and outer sides. This prevented the conjunctiva from turning in the lashes. Hughes did not mention drainage. In one of these cases there was a great deal of secretion inside the sac, with profuse discharge. Some polyps developed where the tarsus was sutured to the lower lid. The profuse

purulent secretion cleared up when the lid was opened and the polyps were removed. In two cases the graft was taken from the brow, leaving a few hairs which acted as lashes.

RECURRING PTERYGIUM TREATED BY AN EPITHELIAL CORNEAL GRAFT

DR. H. W. WOODRUFF reported the case of L. K., a white man aged 41 years, who first consulted us on August 12, 1937, because of a corneal growth (pterygium) on the right eye. He had been aware of it for four years. It had first been treated with medicine by a general practitioner. In March, 1937, it had been operated on by a competent ophthalmologist, but had recurred. Six weeks later a second operation was performed, and it was cauterized. Later a further slight operation was done, the exact nature of which is not known. Recurrence followed after every attempt. Vision was reduced to 6/10, and the patient complained of blurring of vision. The apex of the growth reached the pupillary margin. On August 14, 1937, a McReynolds operation was performed. This, however, was also unsuccessful and the growth returned.

Coincident with this case of recurring pterygium, we had a case of complete corneal opacity in both eyes with symblepharon from an alkali burn. We were able completely to relieve the symblepharon by skin grafts taken from the arm, and we were waiting for a suitable case in which enucleation of an eye was required to furnish clear cornea for an attempt at transplantation. This case was forthcoming in the person of a 20-year-old boy, a patient of Dr. Harold Wadsworth, whose eye had been cut with a chisel. The wound was scleral and very extensive and caused prolapse of the globe. It was therefore thought feasible to attempt corneal graft in both the case

with the opaque cornea and that with the pterygium.

The patient whose eye was to be enucleated (the donor) and the patient with opaque corneae, were anesthetized with avertin; the third patient with pontocaine. A 4-mm. disc was removed from the clear cornea of the donor before enucleation and placed in the previously trephined cornea of the recipient with the opaque cornea. As there was no available conjunctiva, an attempt was made to hold this corneal graft in place by a mucous graft from the lip. In this case there was complete failure.

A lamellar graft was removed from the same cornea of the donor with the Castroviejo cataract knife and placed upon the denuded corneal surface produced by removal of the pterygium. No attempt was made to hold this graft in place except by the closed lids. This was an immediate success.

In this case the corneal graft remained in place and remained clear for two months, following which a blepharitis developed with vesicles on the lid margin and the graft lost some of its transparency, which has not been regained. At present the graft is not entirely clear and the pterygium is in contact with the limbal margin of the graft. The conjunctival portion of the pterygium is very red.

The case cannot be reported as entirely successful as yet, but in view of the fact that corneal grafting is of great interest, this case may merit some discussion and consideration. Von Hippel, Elschmig, Castroviejo, Thomas, and others have done much, both experimentally and practically, to encourage corneal grafting in suitable cases. Is it not possible that epithelial or lamellar forms of corneal grafts may not be worth considering in cases in which the opacity does not extend through the entire thickness of the

cornea? We have in mind making such an attempt on the opaque cornea in the patient who sustained alkali burns.

Discussion. Dr. Harold Wadsworth remarked that the matter of getting the donor and the recipient together was quite a problem. When the patient with the chisel injury was seen, there was a completely collapsed eyeball. Dr. Woodruff advised filling the globe with normal saline. The cornea was not injured; there was a wound about 1 cm. in extent, just above it. The outcome was questionable, and the possibility of using the cornea was discussed. About three weeks after the injury the eye was blind and became atrophic, but the cornea was in excellent condition. While Dr. Harry Woodruff prepared the cornea, Dr. George Woodruff and Dr. Wadsworth enucleated the eye of the patient in the other room, and just before the graft was taken, the globe was again filled with normal saline.

Dr. Elias Selinger said that the difficulty of getting a donor can be overcome in cases where a partial, nonperforating corneal graft was to be used, by employing an autotransplant. About six years ago he saw Dr. Magitot use a very fine gouge to remove the opaque portion of the cornea in a patient with pterygium and, with the same instrument, remove a similar sized piece of clear cornea from the upper half of the cornea and cover the defect with it.

Dr. W. F. Moncrieff recalled a case of pterygium seen about five years ago. Two or three operations had been performed. Each recurrence was worse than the last and the growth became very thick. A skin transplant was made, covering the sclera as well as the cornea. While the graft prevented recurrence of the pterygium, there were different places where vascularization of the cornea took place. This was controlled with radium therapy.

Dr. Harry Woodruff (closing) said he had hoped there might be something

said by some of the expert pathologists regarding the etiology of pterygium. To him it had always been a most mysterious and uncanny occurrence. In a certain few cases it continually recurred in spite of whatever type of operation might be used. It would seem that the term malignant might be applied to some of these cases so far as the pterygium itself is concerned.

In the case presented, he was not at all sure at this time that the corneal graft would act as a barrier to prevent the pterygium from pushing its way through. It was rather early to say, but he was anxious to present the case to see what other members thought of the possibility of a corneal graft in recurrent pterygium, and also the use of the lamellar graft in certain other cases of corneal opacity.

Robert Von der Heydt.

LOS ANGELES SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

September 26, 1938

DR. CLIFFORD B. WALKER, *president*

SULFANILAMIDE TREATMENT OF TRACHOMA

DR. WARREN A. WILSON (Senior Resident Los Angeles County General Hospital; by invitation) stated that 18 patients in all were treated and all had had the old treatment to a greater or lesser extent, including copper stick, silver nitrate, and quinine bisulphate. Three of the children had had Knapp rolling and grattage, one had had a canthoplasty, and three of the adults had had tarsectomies. The ages varied from 8 to 74 years. The duration of the trachoma was 2 to 40 years. Condition of the eyes varied from follicles and early pannus to cicatrix and complete pannus.

Dr. Wilson said that the amount of

sulfanilamide used was least in a girl whose weight was 74 lbs., who received 540 grains, and greatest in a man weighing 190 lbs., who received 2,400 grains. The average was 600 grains for children and 1,000 grains for adults. The average length of treatment was five to six weeks. The usual dosage was one-third grain per pound of body weight for three weeks, followed by one-fourth grain per pound of body weight for three weeks. Two patients who were hospitalized because of severity of the condition, including corneal ulceration, each received three-fourths grain per pound body weight initially, this being somewhat reduced each day. The first patient, who had had the disease for 40 years, was discharged in two weeks; his condition has remained quiet without further treatment (total sulfanilamide 600 grains). The other patient received 80 grains during the first 24 hours and his red-blood-cell count dropped nearly two million. This necessitated a blood transfusion, but after a week or so he was again started on 80 grains (patient's weight 120 pounds), and continued on decreasing amounts for six weeks with no further trouble. This was the only serious complication in this series.

Cyanosis seemed fairly common, Dr. Wilson said, but there was no serious drop in red-blood-cell count or hemoglobin in any case, with the exception of the one mentioned. All patients receive a red and white count and hemoglobin test at least twice a week, and, of course, once before treatment is started. A few patients have had blood sulfanilamide determinations; this varies from 3.5 to 4.0 mg. per 100 c.c. of blood. More work is to be done on this subject. The blood sulfanilamide of patients with gonorrheal conjunctivitis averaged about 10.00 mg. per 100 c.c. but these were all hospital cases and were receiving greater doses of the drug. The

only local treatment has been some mild irrigation such as Ringer's solution and 2-percent sulfanilamide ointment in two cases. This latter drug is probably helpful but has not been thoroughly tried out as yet.

Dr. Wilson stated that all of the patients received symptomatic relief within a week and the eyes were quiet in two or three weeks, except for follicles, which disappeared more slowly, taking three or four weeks. The pannus was qualitatively less by slitlamp examination; that is, the corneal vessels were less well filled with blood.

Three of the first patients received treatment for two weeks only. One of these, mentioned above, is still quiet three months later (he was started with three-fourths grain per pound of body weight). The other two had slight recurrences in about one month but responded very well to a second series of treatment.

PLASTIC SURGERY IN THE REGION OF THE EYE

DR. WILLIAM S. KISKADDEN (by invitation) presented a large series of slides illustrating a great variety of plastic surgery about the eye.

CONTACT GLASSES

DR. CARROL WEEKS presented a motion picture illustrating a method of taking impressions for molded contact glasses. He pointed out that in certain cases the eyeball is so asymmetrical that the standard contact glasses will not fit without discomfort, and in these cases a molded glass can be used. In general, he said, molded glasses are more satisfactory from this standpoint. Particular attention must also be paid to the transitional area between the scleral and corneal curves.

Harold F. Whalman,
Editor.

AMERICAN JOURNAL OF OPHTHALMOLOGY

Published Monthly by the Ophthalmic Publishing Company

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THE MAY MEETINGS IN SAINT LOUIS

The American Board of Ophthalmology changed its system of examination from entirely oral to part oral and part written. The latter preceded the former by several weeks and was given simultaneously in several cities. This system is an improvement because it eliminates the obviously unfit. This reduces the numbers to be handled at the oral examination and requires fewer examiners, less time, space, and materials. It also is more impersonal, since papers are corrected without a knowledge of the candidate's identity. This has always been too important a factor. If it is known that he comes from the office of "Dr. Blank" the examinee is only humanly certain to be prejudiced favorably or otherwise by this fact. It might be helpful in order to diminish even

more this personal factor if the candidate at the oral test were identified by number only. Some few would naturally be known to some of the examiners, but for the most part this would not be true. Written tests do have disadvantages, but another factor in their favor is that each man is asked the same questions, so that it is simpler to make a comparative rating. The written examination this time apparently revealed some rather astonishing general weaknesses, long suspected but not definitely known. There has undoubtedly been a great improvement in the preparedness of the candidates but there has also been a tendency not to require much in certain subjects, accepting as a fact that little will be known.

Another recent innovation has been the examining of those requiring reexaminations on a day in advance of the others.

This does extend the time somewhat and throws some additional burden on the organization entertaining the Board, but spreads out the labor of the Board, and this is very desirable because at best theirs is no easy task.

With this activity over, Tuesday was free for the Research Society program. Attendance was small through failure of invitations to reach all members of the section. This was especially regrettable because the program was one of the best ever presented before this group. The purely scientific nature of most of the papers, the sympathetic audience, the longer time allowed for presentation seem to justify this organization's existence. If it were necessary to pick one paper for a blue ribbon the choice would probably fall on Burky's most comprehensive presentation on "Periodic ophthalmia in horses." He showed, apparently conclusively, that this disease, which had baffled science for many, many years, is due, in some cases at least, to the same organism as that which causes undulant fever, the microörganism *Brucella*. The interesting speculation arises that some of these chronic uveitides, that for want of proof to the contrary have been labelled tuberculous on rather slim evidence, may be examples of brucellosis. The research was beautifully performed and excellently presented.

At the luncheon for this Association, Dr. Edward C. Ellett was nominated for the Dana medal for work in prevention of blindness. This is a very happy selection for honoring an outstanding man in our profession who has devoted his life to the conservation of eyesight.

The Section meeting opened on Wednesday afternoon. Fortunate the men whose papers are scheduled for the first session, because they address a full assembly. Pity the poor fellows who must speak late on Friday afternoon, addressing the heroic

remnants of a hectic week.

The editor was unable to be present for more than a few of the papers, so selection for comment is biased by that fact. For the clinically minded, Lancaster's demonstration of a simple but accurate method for measuring the muscle balance looked like an answer to the ophthalmologist's prayer. Confronted by the choice between Maddox rod, which is often inaccurate, and prism cover test, which is a nuisance, he has had to select one of two undesirable methods. If Lancaster's system proves as accurate and easy to handle as in the demonstration that he gave, it is safe to prophesy that it will rapidly come into general use.

The editor visited the leprosarium at Carville, Louisiana, this spring and hence was particularly interested in Pendergast's essay on leprosy. His excellent paper was accompanied by an interesting exhibit. He had spent six months in Carville, so had had ample time to collect and prepare his material.

Outstanding in merit was a paper by Frederick A. Davis on "Primary tumors of the optic nerve." He also had a splendid exhibit.

The House of Delegates deliberated even longer and more earnestly than usual. Product of this was a complete and unanimous rejection of the Wagner Bill, a matter of great importance to every physician. Harry Gradle was elected Chairman for the coming year and New York was chosen for the meeting place—an opportunity for a late view of the Fair.

Lawrence T. Post.

LOW-PRICED OPHTHALMOLOGY IN GREAT BRITAIN

Virtually all human beings at one time or another need medical care, and the physician has been for centuries one of

the chief agents in the distribution of "charity." Because many of his patients were unable to pay for his services, he found it necessary to collect from more prosperous patrons fees sufficiently large to compensate him for the time devoted to the poor. Even today, in certain parts of the world, the same relationship is exemplified by the fact that one entrance to the physician's premises is labeled "Dispensary," and another entrance "Surgery"; the former being the place where fees are minimum (for services to the poor or relatively poor), the latter the place where fees are higher (for services to the well-to-do).

Inasmuch as every effort to establish Utopia seems doomed to disaster, human society is likely to present always widely varying degrees of success and failure, of wealth and poverty; and practical efforts at social reform are aimed rather at mitigation of these differences than at their complete abolition. Increasing recognition of the universal necessity for efficient medical care renders more and more evident the desirability of making adequate provision for every stratum of society, from the richest to the poorest. Today the opinion is very commonly expressed that the rich and the poor are well cared for, and that the most urgent need for improvement in medical service relates to the lower middle class, who pay for what they get and therefore do not come within the purposes of so-called "charitable" institutions, but on the other hand cannot afford the more expensive modern methods of medical investigation, and are not infrequently overwhelmed by the cost of long-drawn-out periods of illness.

The various schemes of community health insurance have been designed especially for the lower-middle-class group. The British national health insurance plan has taken fairly good care of that section

of the community in regard to general ailments, notwithstanding certain weaknesses and abuses which have been much publicized in the United States. At first, however, the British scheme made little or no provision for obtaining the services of specialists.

An attempt by the sight-testing opticians of Great Britain to obtain legal recognition, including the establishment of a national licensing system, led in 1927 to the appointment of a government Departmental Committee of investigation. This committee's report pointed out that the work of ophthalmic surgeons was practically limited to the well-to-do and the poor (the latter dealt with in hospital clinics), whereas no such provision was made for the artisan public class.

The apparently imminent danger that the "Optical Practitioners Bill" (the title of the proposed legislation) would be enacted into law paved the way for a promise by the British Medical Association to establish a scheme whereby those of limited income might obtain proper ophthalmologic advice, and also the necessary spectacles, at reduced prices. The result was the creation of the "National Ophthalmic Treatment Board."

The report of the Departmental Committee on the Optical Practitioners Bill contained the following significant statements: ". . . it is possible and probable that the medical profession will be able to provide insured persons . . . with the services of oculists. . . . We hope also that such a service will be extended to the non-insured population.* If, however, for any reason, these hopes are not fulfilled within a reasonable time we do not wish our report to preclude the possibility of a reconsideration of the question in the light of the circumstances then existing."

* That is, of restricted means but not then included within the provision of the national health insurance laws.

The constitution of the National Ophthalmic Treatment Board was drawn up jointly by the British Medical Association and the (British) Association of Dispensing Opticians, and received the approval of the majority of the British ophthalmologists. It has been in operation since 1929. The Board is made up of three medical members appointed by the British Medical Association, three dispensing opticians appointed by the Association of Dispensing Opticians, a medical secretary who is the secretary of the British Medical Association for the time being, and a general secretary who is the secretary of the Association of Dispensing Opticians for the time being. Medical appointments are made upon nomination by the British Medical Association, and dispensing appointments upon nomination by the opticians' organization. The chairman of the Board is a physician and has a casting vote.

As to fees, the arrangement at first established by the British Medical Association was to set up a list of "ophthalmic practitioners" who were "willing to treat insured persons and to prescribe glasses, at a fee of one guinea" (about \$5.00 at the present rate of exchange). For various reasons this plan did not work very well, and a later plan provided that the work should be carried on partly in central clinics and partly at "home clinics at the ophthalmic practitioner's consulting room." The fees allowed under the latter arrangement were about \$2.50 for consultation and report, with various additional allowances for glasses if these were ordered. Somewhat similar provisions for care of "insured persons" were made by various hospital organizations.

Quite naturally, the work of the National Ophthalmic Treatment Board has been viewed with criticism and sometimes with misunderstanding. It has been accused of being run by a section of the

optical dispensing trade, of favoring large dispensing optical firms to the disadvantage of smaller firms, of yielding a substantial income to the British Medical Association, and of affording an excessive profit to the dispensing opticians.

A denial of these criticisms, and an appraisal of the very real benefits which have accrued from the work of the Board, were set forth by the chairman of the Board, N. Bishop Harman, in a recent issue of the British Medical Journal (1939, February 25, Supplement).

When the Board began its work there were in the whole of Great Britain only forty-five establishments conducted by purely dispensing opticians. It had been expected that many of the sight-testing opticians would abandon sight testing and join the ranks of the dispensing opticians, but this anticipation was not fulfilled. Thus, in order to avoid such destructive competition as would have defeated the purposes of the Board, the employer members of the Association of Dispensing Opticians found it advisable to enter into a voluntary agreement that only one dispensing license would normally be granted in respect of each town hitherto without a dispensing service, until such time as a dispensing service had been established in every town in which there was a practicing ophthalmologist.

The most remarkable result of this voluntary agreement is that within less than ten years dispensing establishments have increased tenfold, and the ultimate object of providing a dispensing service wherever there is a practicing ophthalmologist has almost been attained. Employees of dispensing firms have been encouraged to start in business for themselves and to obtain dispensing licenses.

Interesting details of the finances of the National Ophthalmic Treatment Board, as recorded by Harman, are (1) that for initiation of the work of the

Board a substantial loan, since repaid, was obtained from the British Medical Association; (2) that commissions collected by the Board from the dispensing opticians on the sale of spectacles provided under the National Eye Service (amounting to about \$225,000) have been in large part devoted to propaganda as to the work of the Board, among the industrial class for which the eye care is intended; (3) that in the past nine years the dispensing opticians have spent not less than \$750,000 upon expansion of the dispensing service; that fixed scales of prices for optical appliances have been established by the Board and other organizations concerned; and that expert care under the National Eye Service is furnished only to insured persons and their dependents whose family incomes are not more than \$1,250 per annum.

In the United States the British scheme would be approved by some, bitterly condemned by others, partly according to the conditions prevalent in different communities, and partly according to the social and economic beliefs of individual physicians. The efficiency of such low-priced ophthalmologic practice may be open to question: it must naturally vary in the hands of different practitioners. But so, quite often, does the efficiency of clinic practice (where usually no fees to the physician are forthcoming), or even the efficiency of practice (especially refractive practice) among the well-to-do.

Harman concludes his essay by pointing out that the work of the National Ophthalmic Treatment Board has a far wider sphere of advantage than the direct provision which it makes for a restricted social group. The broader gain consists in impressing upon all classes of the community the importance and economic value of medical care of their eyes.

W. H. Crisp.

VITAL STAINING OF THE RETINA

The staining of living tissues was tried as a laboratory experiment 25 years ago. But in general it was found that substances that were effective in such staining were toxic. It remained doubtful if such staining might occur only after the tissue had been devitalized. Recently Arnold Sorsby, of London, found that a certain stain, Kiton Fast Green V, could be used to stain tissue without any dangerous poisoning effects. The clinical dose that would do this was worked out on monkeys. Then the experiment was made on patients with retinal disease. It was found that inflammatory exudates and damaged retinal tissue could be stained without staining the normal retina; although the normal retina could be stained temporarily. He exhibited patients in whom the retina had thus been stained at meetings of the Physiological Society and the Ophthalmological Society, in 1938.

In the January issue of the *British Journal of Ophthalmology* is a colored plate illustrating the staining of the retina in a case of detached retina, bringing out places at which there were ruptures of the retina and also a slight staining of the atrophic optic nerve. This method seems to offer a means for a diagnosis of retinal disease. Normal retina quickly becomes decolorized. But parts of the retina damaged by a cautery retained the color and thus become evident on ophthalmoscopic examination. Somewhat the same service is rendered as a test of the health of the optic nerve.

This method of clinical investigation might well be applied to the study of glaucoma. It is widely recognized that certain factors in the causation of glaucoma are still not understood. Experimental tests in the early stages might have practical value. It should also be tried in the

early stages of Leber's disease, which has usually been considered an optic atrophy, but which may begin in disease of the macular part of the retina, the nerve atrophy being secondary to the retinal disease. Another practical application of it, which may be of great importance, will be to test for damage to the choroid and retina by methods of cataract extraction that have been found to cause detachment of the choroid, and certainly may cause some damage to the retina.

Edward Jackson.

THE ALLEN PRISM CHART

Two forces capable of producing motion, acting upon the same point from different directions, produce a resultant effect in a direction lying between the directions of the two forces; and an increased effect, dependent upon the angle between their two directions. Conversely a single force acting in the direction of the resultant and equal to it, will produce the same motion as the two supposed original forces. The problem of the parallelogram of forces may be found stated and illustrated, in almost any elementary book on physics. This general relation holds when the forces in question are the refractive effects of two prisms. The resultant prism of a certain strength, acting in the resultant direction, produces the same effect as the two component prisms. One can take pencil and paper and, with a ruler and protractor of angles, can lay out the action and effect of any two prisms acting in any two directions. The working out of a few supposed problems of this kind will bring an understanding of the principle involved. With such an understanding, the revised prism chart of Dr. Thomas D. Allen furnishes a means of reading at a glance the prism strength and direction of its axis, that will be required to com-

pensate any case of heterophoria that has been determined for both vertical and horizontal directions—a hyperphoria with exophoria or esophoria.

Whether one uses a Maddox rod or a phorometer, it is worth while to record the phorias for every refraction case. If it seems important to compensate the phoria in prescribing a correcting glass, a glance at the Allen chart will indicate the direction and the strength of the prism required to do it. To apply the principle, by one's own diagrams for a few cases, may enable one to utilize this time-saving device.

Edward Jackson.

BOOK NOTICES

CORTEZA VISUAL (Visual cortex).

By Drs. Flaminio Vidal and Baudilio Courtis. 307 pages, 301 photographs. Buenos Aires, Aniceto Lopez, 1938. Price not stated.

In the introduction the authors state that they have spent many years in gathering, preparing, and examining the material for the work, and this is borne out by the amount of data presented. Their purpose in undertaking this study was to gain a better understanding of the recognition function of the peristriate zone of the visual cortex, with special reference to the localizing value of the symptoms produced by lesions in that area. This monograph is but the first part of a projected series and is intended as a basis for further studies. The first section of the paper is devoted to a description of the macroscopic configuration of the fissures and lobes of the occipital cortex in man, as illustrated by several cases of major psychoses and one case of arteriosclerosis. This is followed by similar descriptions of a large number of specimens from various orders of mam-

mals—primates, elephants, horses, carnivora, rodents, ungulates, anteaters, tapirs, marsupials, and bats. There are also specimens from birds, reptiles, fish, and invertebrates.

The authors conclude that in man there is an unequal development of the two visual lobes, with a parallelism between the development of the visual lobe and the recognition function. It is in birds that the mesencephalic optic lobule acquires its maximum development. The possibility of a zoölogical classification on the basis of cerebral morphology is suggested.

There is a short bibliography.

Frederick A. Wies.

OPHTHALMIC NURSING. By D. E. Grand. Clothbound, 110 pages, illustrated. Baltimore, Wm. Wood and Co., 1938. Price \$1.75.

The great responsibility of the nurse in the supervision and treatment of eye diseases is emphasized. The material is presented in outline form and alphabetically arranged so that it may be used as a ready reference book on ophthalmic wards. The section on ophthalmic instruments and operations is well illustrated. The writer displays a keen understanding of the psychology and care of the visually handicapped.

William M. James.

OBITUARY

ROBERT SATTLER

1855-1939

Doctor Robert Sattler was born in Cincinnati, Ohio, on July 23, 1855. He was the son of Dr. George and Johanna Langenheimer Sattler. His father was a native of Hanover, Germany, and had obtained his degree from the University of Göttingen, coming to Cincinnati shortly thereafter. His mother was a Viennese.

Doctor Robert Sattler was educated in

the public schools in Cincinnati, received his medical education at the old Miami Medical College in 1875, and served his internship in the Cincinnati General Hospital, where he became acquainted with Dr. Elkanah Williams, who was the first ophthalmologist west of the Alleghenies, and introduced the ophthalmoscope for the first time to this country in 1855. Dr. Williams induced Dr. Sattler to take up the specialty of ophthalmology. Following this advice he spent one year in New York



Robert Sattler, M.D.

with Dr. Herman Knapp and Dr. Heitzmann. Having completed his course of studies there he went abroad and worked under Von Arlt and Jaeger in Vienna and under Von Graefe in Berlin. He then traveled to Utrecht and worked in Donders's laboratory for some time. Dr. Sattler was well acquainted with Bowman and Hutchinson in London. Returning to

Cincinnati in 1878 he became associated with Dr. E. Williams and Dr. Stephen C. Ayres in a partnership, until the death of Dr. Williams in 1888.

In 1890 Doctor Sattler founded the Cincinnati Ophthalmic Hospital. This hospital was modeled from the European private clinics, taking all cases, rich and poor, coming to the door. There was an enormous clientele to whom Dr. Sattler gave freely of his time and skill. Among those associated with Dr. Sattler at the Ophthalmic Hospital were Dr. Stephen C. Ayres, Dr. Christian Holmes, Dr. Robert Heflebower, Dr. Victor Ray, Dr. A. E. Sanders, and Dr. Clarence King. Among the ophthalmologists living in Cincinnati who were trained by him are Dr. Horace Reid, Dr. Charles Hosling, and Dr. Louis Hendricks. Dr. Sattler was made Professor of Ophthalmology at the Miami Medical College in 1882. In 1910 the Ohio Medical School and Miami Medical College became amalgamated to form the College of Medicine of the University of Cincinnati. Dr. Sattler held the position of Professor of Ophthalmology until 1925.

He was a member of the Cincinnati Academy of Medicine, Ohio State Medical Association, American Medical Association, and of the American Ophthalmological Society, of which he was president in 1914-1915.

His health remained excellent and he

was in full vigor until 1925, at which time he underwent several serious operations but recovered sufficient health to continue practice until the day of his death. He died in his office on February 20, 1939, just after he had completed the examination of a patient.

He married Maude Ray, sister of Dr. Victor Ray. She died in 1897. They had six children, four of whom still live. In 1903 he married Agnes Mitchell, who, with their two children survive.

Dr. Sattler was energetic, accurate, resourceful, and a skillful surgeon. He commanded the confidence of his patients and colleagues. The poor received the same consideration as those who were more fortunate.

He was fond of literature and art. He could read and speak fluently Italian, French, and German.

In his death American ophthalmology has lost one of the last few links with the great school of Von Graefe.

He was directly in line with Dr. Williams and in touch with the early discoveries of ophthalmology which revolutionized the subject. His clinic and hospital were kept intact until a few months before his death. To the young ophthalmologists in times of depression and worry he stood like a rock, his steadfastness giving them confidence in the future.

Derrick Vail.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

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| 1. General methods of diagnosis | 10. Retina and vitreous |
| 2. Therapeutics and operations | 11. Optic nerve and toxic amblyopias |
| 3. Physiologic optics, refraction, and color vision | 12. Visual tracts and centers |
| 4. Ocular movements | 13. Eyeball and orbit |
| 5. Conjunctiva | 14. Eyelids and lacrimal apparatus |
| 6. Cornea and sclera | 15. Tumors |
| 7. Uveal tract, sympathetic disease, and aqueous humor | 16. Injuries |
| 8. Glaucoma and ocular tension | 17. Systemic diseases and parasites |
| 9. Crystalline lens | 18. Hygiene, sociology, education, and history |
| | 19. Anatomy, embryology, and comparative ophthalmology |

1

GENERAL METHODS OF DIAGNOSIS

Bahr, Gunnar. Color photography of the fundus. *Acta Opth.*, 1938, v. 16, pt. 4, p. 483.

Like Bedell, the author uses Kodachrome type-A film in a Zeiss-Nordenson camera. Ray K. Daily.

Baltin, M. M. The application of X rays and radium in ophthalmology. *Viestnik Opht.*, 1938, v. 13, pt. 5, p. 592.

In Czarist Russia no X-ray service was available. During the Soviet regime two factories for the manufacture of X-ray equipment have been established, and X-ray laboratories have been set up all over the land. Baltin thinks that the ophthalmologic service is not making sufficient use of the available X-ray facilities, and urges closer coöperation between the ophthalmologic and X-ray services.

Ray K. Daily.

Batenko, P. M., and Belostozki, E. M. The effect of altitude on the blind

spot. *Viestnik Opht.*, 1938, v. 13, pt. 6, p. 816.

The test shows enlargement of the blind spot in high altitudes. Inhalations of oxygen are followed by return of the blind spot to its normal size, which shows that the etiologic factor is anoxemia. Ray K. Daily.

Berens, C., and Beach, S. J. A chart for testing visual acuity and astigmatism. *Amer. Jour. Opth.*, 1939, v. 22, March, pp. 304-305.

Chernikova, T. V., and Rubanovich, I. M. Roentgenography of enucleated eyes. *Viestnik Opht.*, 1938, v. 13, pt. 5, p. 629.

The examination proposed by the authors demonstrates ossification of the eye, exudates and hemorrhages in the anterior chamber and vitreous, dislocation of the lens, topography of intraocular foreign bodies, and retinal detachment. With this procedure one can differentiate an actual retinal detachment from an artefact occurring in fixation of the eyeball.

Ray K. Daily.

Escher-Desrivieres. Observation of a moving stimulus in the periphery of the visual field. Quantitative determination. *Bull. Soc. d'Ophth. de Paris*, 1937, Oct., pp. 587-591.

Two hundred observations are averaged at the four principal meridians, giving results in "centimeter seconds." By closing a switch the subject controls the recording. Thus the reaction time is also recorded. Simultaneous recording of reaction time and extent of field is suggested to be of value in determining ocular fitness for certain occupations. Harmon Brunner.

Ferree, C. E., and Rand, G. A glareless illuminated holder for visual-acuity test charts with variable intensity of light. *Amer. Jour. Ophth.*, 1939, v. 22, April, pp. 399-405.

Heinsius, Ernst. Some aids for testing dark adaptation. *Klin. M. f. Augenh.*, 1939, v. 102, Feb., p. 196.

An examining room for light adaptation, a fixation point for the adaptometer of Engelking-Hartung, the procedure of adaptation tests on series of applicants, and the testing of distinction ability are described in detail. The methods proved very satisfactory in the Marine Hospital at Kiel-Wik.

C. Zimmermann.

Hosford, G. N. Counterbalanced wall bracket for suspending Comberg slit-lamp. *Amer. Jour. Ophth.*, 1939, v. 22, April, pp. 427-428.

Martin, H. G. The practical measurement of accommodation and convergence. *Amer. Jour. Ophth.*, 1939, v. 22, April, pp. 406-412.

Pickard, Ransom. A light-threshold apparatus. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 448.

The apparatus differs from that pre-

viously described by the author (see *Amer. Jour. Ophth.*, 1937, v. 20, p. 859) in having Wratten light-filters arranged on rotating discs. Beulah Cushman.

Sorsby, Arnold. Two patients with vital staining of the fundi. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 275.

Basic dyes with a sulphonate radicle, such as kiton fast green, gave staining of the central nervous system and were nontoxic. The normal retina did not stain but damaged retina did stain. This was demonstrated in a patient with chorioretinitis and one with a hole in the retina. Beulah Cushman.

Szász, Alexander. The dissolving power of the eye and its testing. *Magyar Orv. Arch. (Hungarian)*, 1938, v. 39, p. 643.

To test the dissolving power of the eye the author constructed three charts upon which squares and oblong figures of exact dimensions were photographed. The size of the figures varied from 120" to 30"; each consecutive figure was smaller by 10". The examination was carried out at one and five meter distances. On one chart the distance between the squares equalled the size of the square. On the second chart the distance between two squares was equal to the diameter of two squares. Upon the third chart the distance between the figures was again equal to the size of one square, but the figures were rectangles with bases twice as long as their height. The author is carrying on comparative examinations on a large scale to determine the usefulness of this method. R. Grunfeld.

Vanzant, T. J. Night blindness as determined by the biophotometer. *Texas State Jour. Med.*, 1938, v. 34, July, p. 231.

The author describes the use of the biophotometer in testing for night blindness, with particular reference to that type due to vitamin-A deficiency. In tests on 176 patients, using standard values advocated by Jeans and Zentmire, he found 20 percent to be subnormal, 31.2 percent borderline, and 48.8 percent normal. (Illustrations.)

George A. Filmer.

Vishnevskii, H. A. Charting of the blind spot as a diagnostic and prognostic procedure in ocular diseases. *Viestnik Opht.*, 1938, v. 13, pt. 6, p. 799.

The author registers recognition of the test object rather than its disappearance from the visual field, and believes that data thus obtained are more accurate. The study failed to show any interrelation between the size of the blind spot and visual acuity. There was also no correspondence between the size of the blind spot and intraocular tension. With marked postoperative fall in intraocular tension the blind spot might be found enlarged. Lowered visual acuity and contraction of the visual field did not always lead to an enlarged blind spot. In retrobulbar neuritis the blind spot was smaller than in other diseases of the optic nerve and could be charted even in the presence of very low visual acuity. In glaucoma the diagnostic feature is not so much enlargement of the blind spot as extension from its upper and lower borders. In persons with unstable fixation the blind spot appears very small and may not be detectable. With corrective glasses, in cases with considerable reduction in visual acuity, the blind spot is smaller than it is without correction. In myopia with myopic conus and posterior staphyloma the blind spot is enlarged. In Seidel's test the change in the blind spot is insignificant. In difficult diagnosis of lesions of the neurovisual appara-

tus the comparison of the blind spots of the two eyes offers valuable information.

Ray K. Daily.

2

THERAPEUTICS AND OPERATIONS

Attiah, M. A. H., and El Tobgy, A. F. A preliminary note on the therapeutic effect of short waves in certain eye diseases. *Bull. Ophth. Soc. Egypt*, 1937, v. 30, p. 190.

The biologic actions which are stimulated in tissues exposed to short-wave therapy are listed and two cases are reported. The first was a tumor mass of granular tissue, which showed no improvement after twenty treatments. The second was a case of tuberculous iritis of the nodular type which showed slight improvement after two courses of treatment. Edna M. Reynolds.

Baltin, M. M. The application of X rays and radium in ophthalmology. *Viestnik Opht.*, 1938, v. 13, pt. 5, p. 592. (See Section 1, General methods of diagnosis.)

Berens, Conrad. Sclerotomy scissors for enlarging corneal incisions. *Amer. Jour. Opht.*, 1939, v. 22, March, p. 304.

Birch-Hirschfeld, A. Short-wave therapy in ophthalmology. *Klin. M. f. Augenh.*, 1937, v. 103, Jan., p. 107.

The literature contains about 1,500 cases of eye diseases treated with short waves, with favorable results and without deleterious effects. The author treated 94 cases, 57 yielding very good, 24 good, 9 moderate, and 4 no results. The best results were obtained in inflammatory and purulent diseases of the lids and lacrimal sac, superficial keratitis, and neuralgias of the fifth nerve. Ten cases of superficial keratitis and two of corneal ulcer were also irradiated with ultraviolet light, and the

combined treatment yielded better results than one method alone. Two cases of spontaneous and nine of tuberculous iritis reacted rapidly and favorably and so did four of neuromyolytic keratitis, one after longer duration. Short-wave therapy proved beneficial in fifteen cases of exudative choroiditis and out of nine cases of opacity of the vitreous three cleared up quickly and three were improved. Short waves act favorably and soothingly on the anterior segment, and may be beneficial in inflammations of the retina, choroid, and optic nerve. C. Zimmermann.

Bröns, J. Local treatment of the eye with vitamin A. *Oft. Selskab i Köbenhavn's Forhandlinger*, 1937-1938, pp. 18-22. In *Hospitalstidende*, 1938, Dec. 13.

Emmetropic school children with symptoms of asthenopia were found to improve with administration of cod-liver oil. The inference was that they suffered from an avitaminosis. Later the author used two concentrated vitamin-A preparations by instillation in the eyes in cases of intractable blepharoconjunctivitis, with very good results.

Indefinite symptoms of pain in the eyes, tenderness of the eyeballs, especially in myopes, for which no explanation could be found, have responded very well to the same treatment. Since instillation of these preparations is often followed by pain, it is always carried out by the physician at his office, once or twice a week.

D. L. Tilderquist.

Busacca, Archimede. Results obtained by use of sulphanilamide preparations in some conjunctival disturbances and in other ocular affections. *Folia Clin. et Biol.*, 1938, no. 6, pp. 198-202.

The results in many conditions were negative, but intravenous injection of the drug (para-aminophenylsulphamide) was decidedly beneficial in cases of dacryocystitis and peridacryocystitis. In one case, after a fifth injection of 10 cg. a diarrheal reaction disappeared promptly upon omission of the drug; and a dosage of 5 cg. was resumed after three days, without further complications.

W. H. Crisp.

Comberg, W. Iris adhesions during operations, and a small instrument for reposition of the iris. *Klin. M. f. Augenh.*, 1939, v. 102, Jan., p. 44.

Comberg discusses the iris adhesions occurring during operations, namely folding and adhesion during iridectomy, peripheral folding in cataract extraction, and adhesion by touching the upper lip of the wound in different operations on the eyeball; as well as the difficulty of overcoming them and the deleterious consequences. He has designed a ball-pointed hook for separating adhesions.

C. Zimmermann.

Dolfuss, M. A., Di Matteo, and Proux. Trial of chemotherapy on ocular complications of gonococci by the organic derivatives of sulphur. *Bull. Soc. d'Ophth. de Paris*, 1938, no. 2, Feb., p. 73.

Results from use of sulphanilamide (1162 F) on dacryoadenitis, gonorrheal conjunctivitis, and ophthalmia neonatorum were favorable as to clinical improvement; but the organisms persisted in some cases. Corneal complications were not improved.

Harmon Brunner.

Frank-Kamenetski, Z. G. Iridectomy ab externo. *Viestnik Ophth.*, 1938, v. 13, pt. 5, p. 649.

The merit of this technique, according to the author, is avoidance of direct

injury to the lens by the knife and slower emptying of the anterior chamber; which makes spontaneous rupture of the lens capsule less likely.

Ray K. Daily.

Goldfeder, A. E., and Madievskaja, E. I. The use of novocaine blockade after Speransky-Vishnevsky in ocular diseases. *Viestnik Opht.*, 1938, v. 13, pt. 6, p. 740.

The experience with fifty cases leads the author to conclude that a paraneuric novocaine injection has a favorable effect on ocular diseases. The best results are obtained in acute inflammatory conditions of the cornea and uvea; no undesirable symptoms were noticed; there was usually a focal reaction in the eye and sometimes a constitutional reaction; in similar cases the effect of the procedure was not always the same.

Ray K. Daily.

Grelault. Hexamethylene-tetramine in ocular therapeutics. *Bull. Soc. Franç. d'Opht.*, 1938, v. 51, pp. 631-641.

The author states results obtained with this substance in the treatment of various conditions of the eye. He describes in detail the method of injection at the posterior pole of the eye for conditions of the retina and choroid in that region. Another method of administration is injection under the conjunctiva at the limbus. Clarence W. Rainey.

Hasler, W. T., Jr. Standardization of the preparation of eye drops. *Amer. Jour. Ophth.*, 1939, v. 22, April, pp. 423-426.

Heupke, W. Modern questions of nutrition. *Klin. M. f. Augenh.*, 1939, v. 102, Feb., p. 161.

In this lecture the author discusses the importance of diet not only in treatment of internal diseases but also as a

supportive in operations and local procedures in ophthalmologic diseases.

C. Zimmermann.

Hughes, C. A. Poisoning from use of one-percent atropine ointment. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 444.

A 9½-year-old girl became ill the second day the ointment was used, with a temperature of 103°, dry skin, flushed face, scanty urine, and disorientation. The patient was treated for a week with morphine and pilocarpine before her general condition returned to normal.

Beulah Cushman.

Kaganova, O. A., and Bikhovski, M. A. Roentgenotherapy in ocular inflammations. *Viestnik Opht.*, 1938, v. 13, pt. 5, p. 661.

The experience with 185 cases shows that roentgenotherapy is definitely indicated in episcleritis and fresh cases of scleritis and uveitis. In follicular trachoma this form of therapy is an adjunct to the usual therapeutic agents. It is less effective in keratitis, dacryocystitis, keratitis rosacea, and epiphora. In blepharitis it produces temporary improvement.

Ray K. Daily.

Kolenko, A. B. Experimental data on desensitization in ophthalmology. *Viestnik Opht.*, 1938, v. 13, pt. 6, p. 778.

Rabbits, sensitized to horse serum, were given a series of milk injections in increasing doses, with the objective of determining the effect of such injections on the degree of sensitivity. The conclusions are that milk in small and increasing doses serves as a good desensitizer; that preliminary injections do not prevent development of sensitization, and that simultaneous injections of horse serum and milk result in a lower degree of induced sensitivity than is obtained without the milk. Preg-

nant animals are sensitized more readily than normal animals, and the dosage for pregnant animals is not the same as for normal animals. Ray K. Daily.

Lyle, T. K. Ophthalmic operations under evipan anesthesia. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 299.

The technique of using evipan is given in detail, with indications as well as contraindications. Lyle feels that it is especially indicated in squint operations, excision and evisceration of the eyeball, operations for acute glaucoma, iris prolapse, excision of the lacrimal sac, and lid and cataract operations.

Beulah Cushman.

Orlova, E. V. Carotin in the treatment of diseases of the anterior ocular segment. *Viestnik Opht.*, 1938, v. 13, pt. 4, p. 560.

On the basis of clinical experience the author concludes that carotin stimulates tissue recovery. He found it especially effective in burns and in trophic ocular disturbances. It possesses analgesic but no anesthetic properties. It shortens the course of the disease but does not prevent recurrence.

Ray K. Daily.

Remelé. The value of the gold preparation Solganal B oleosum in the treatment of ocular tuberculosis. *Klin. M. f. Augenh.*, 1939, v. 102, Jan., p. 88.

The author reports on his treatment of 23 cases (35 eyes) of ocular tuberculosis (iridocyclitis, sclerokeratitis, choroiditis, papillitis, and retrobulbar neuritis). Over a period of six years he obtained complete cure in 25 eyes, some improvement in 3, and considerable benefit in 7.

C. Zimmermann.

Riad, Mahmoud. Idiosyncrasy to pontocaine. *Bull. Ophth. Soc. Egypt*, 1937, v. 30, p. 188.

A case of marked idiosyncrasy to pontocaine in a young man suffering from spring catarrh.

Edna M. Reynolds.

Rowbotham, E. S. Paraldehyde narcosis. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 306.

Paraldehyde is one of the safest narcotic drugs. It is given by rectum, and the narcosis can be prolonged after the operation as long as necessary. Local anesthetics must be relied upon to protect the patient from pain. The detailed method is given, as applied to different groups of patients.

Beulah Cushman.

Sander-Larsen, S. Pontocaine eczema. *Acta Ophth.*, 1938, v. 16, pt. 4, p. 647.

The author reports several cases of eczema of the hands caused by pontocaine, and warns against its use in surgery of the eye, for fear of encountering patients sensitive to the drug.

Ray K. Daily.

Weekers, L. Treatment of ocular affections with orbital injections of alcohol. *Ann. d'Ocul.*, 1939, v. 176, Feb., pp. 81-99.

Injection of alcohol into the orbit is not so dangerous as is commonly believed. As much as 1 c.c. of 40-percent alcohol may be injected without fear of damage to the optic nerve, although moderate discomfort may ensue for a short period. Alcohol injections are very satisfactory in control of ocular pain from various causes. Both clinical experience and animal experiments indicate that alcohol produces a definite fall in intraocular pressure which may last for several days. It also helps to control photophobia, lacrimation, and blepharospasm. The only serious complications which the author has en-

countered are transient paralysis of the external rectus and permanent paralysis of the pupil. John M. McLean.

3

PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Ajo, A., and Teräskeli, H. Additional flicker studies in color blindness. *Acta Opth.*, 1939, v. 16, pt. 4, p. 518.

The authors add one more color-blind case, studied with the flicker method, to the two whose findings they reported in a previous publication (see *Amer. Jour. Opth.*, 1938, v. 21, p. 693). The tabulated report on the third, totally color-blind patient, shows that the fusion frequency was one third of its normal value, that it was independent of the illuminated area, and that it was constant for the entire visual field. The fusion frequency during dark adaptation is lower than in normal eyes, and is represented by a single curve; the fall in fusion frequency during dark adaptation sets in later than normal. Uniform fusion frequency in the entire visual field indicates to the authors a lack of differentiation between the receptors of the center and periphery of the retina. Delayed fall in fusion frequency during dark adaptation suggests a disturbance in the function of the rods.

Ray K. Daily.

Baratta, Orazio. Experimental researches on the action of sympamine. *Boll. d'Ocul.*, 1939, v. 17, May, pp. 401-413.

Note: Sympamine, or phenyl-isopropyl-amine, is known as benzedrine in the United States.

In tabulated form the writer gives the results of his experiments with this substance on normal human eyes. Upon instillation it provokes mydriasis for about one hour by stimulation of sym-

pathetic terminations. If used together with cocaine it gives signs of unilateral synergism; with homatropine and atropine it increases their mydriatic effect. Pilocarpine has a prompt contracting action on a pupil dilated by sympamine, whereas, if pilocarpine has been instilled first sympamine has no effect on the miosis. Sympamine does not affect intraocular tension. Thus the drug may be used in ophthalmology for diagnostic purposes. (Bibliography.)

Melchior Lombardo.

Barbel, I. E. Congenital achromatopsia. *Viestnik Opht.*, 1938, v. 13, pt. 5, p. 598.

A report of a thorough study of three cases. In two, dark adaptation was more active than normal, a phenomenon which the author explains by absence of the inhibitory action of the cone apparatus. In the third case, which had bilateral macular coloboma, dark adaptation was normal. A central scotoma could not be demonstrated, and the history was that the nystagmus and photophobia had improved with the age of the patient. These phenomena lead the author to assume that the case represents an atypical adaptability of the rod apparatus.

Ray K. Daily.

Berens, C., and Beach, S. J. A chart for testing visual acuity and astigmatism. *Amer. Jour. Opth.*, 1939, v. 22, March, pp. 304-305.

Bosa, F. The pH of the aqueous and lens in parathyroidectomy. *Rassegna Ital. d'Ottal.*, 1938, v. 7, Sept.-Oct., pp. 613-621.

Bosa removed the parathyroids from fifteen rabbits and studied the pH of the aqueous and lens in relation to the production of cataract in such animals. He found that there was a slow but evident increase in the pH of the blood

serum, the aqueous, and the lens. This rise of pH tends to overcome the increased imbibition of fluid by the lens which occurs in parathyroidectomized animals.
Eugene M. Blake.

Cogan, D. C., and Cogan, F. C. **Color fatigue in the peripheral visual field.** *Ophthalmologica*, 1938, v. 96, Dec., p. 137.

The authors measure color fatigue by noting the time it takes for a square of colored paper mounted on a neutral grey of the same luminosity to lose its hue and disappear on the background. This was repeated at spaces on the retina separated by ten degrees, brought about by changing the point of fixation rather than the position of the color object. Red, green, yellow, and blue were used and data were gathered upon four subjects. The variation among normal individuals was too great to permit the use of color fatigue as a clinical test. Fatigue is more easily induced in the periphery. The eyes fatigued most readily for green and least for red. Increase of size of object was associated with a disproportionate increase of fatigue time. With increase of light intensity, there was some increase in fatigue time. Binocular fatigue time was not appreciably longer than monocular.
F. Herbert Haessler.

Crisp, W. H. **Shall we use cycloplegics?** *Amer. Jour. Ophth.*, 1939, v. 22, April, pp. 392-395; also *Trans. Amer. Ophth. Soc.*, 1938, v. 36, p. 35.

Crozier, W. J., and Holway, A. H. **Theory and measurement of visual mechanisms. 1. A visual discriminometer. 2. Threshold stimulus intensity and retinal position.** *Jour. Gen. Physiology*, 1939, v. 22, Jan. 20, pp. 341-354.

A device is described which permits the investigation of different aspects of human visual excitability over a wide

range of luminous intensities. Monocular threshold-stimulus intensities were measured along the 180° meridian in three subjects. No direct correlation was found to exist between visual sensitivity and the number of retinal elements. Binocular threshold stimuli were also measured along the same meridian and found to give results essentially similar to those for monocular sensitivity. It is concluded that the results show the process of threshold response to be localized in the central nervous system and not in the retina.

T. E. Sanders.

Doesschate, G. ten, and Fischer, F. P. **Concerning optical illusions produced by a rotating beacon.** *Ann. d'Ocul.*, 1939, v. 176, Feb., pp. 103-109.

The authors discuss the apparent curvature of a lighthouse beam when seen at night, a phenomenon which has been debated for many years in connection with real and apparent distances. They believe that there is a definite limitation of visual space at night to about 100 m., and that projection of points on a straight line to a circle with such radius produces the illusion of bending, starting about 49 m. from the point of observation.

John M. McLean.

Escher-Desrivieres, J. **The sensibility of the peripheral retina for moderate brilliance.** *Bull. Soc. d'Ophth. de Paris*, 1938, Jan., p. 7.

A photometric monocular comparison was made between the fovea and the retinal area eight degrees from the central axis. It was found that to secure equal brightness the illumination of the peripheral object had to be reduced as follows: white light, 0.47 to 0.60; yellow, 0.53 to 0.67; blue-green, 0.44 to 0.35. There was no difference for red. Illumination was never below one lux.

The usually accepted figures are for reduced illumination.

Harmon Brunner.

Haas, Emil. *Contact glasses*. Bull. Soc. d'Ophth. de Paris, 1937, Nov., supplement.

A report of 250 pages to the full society. The subject is covered completely, beginning with the optics, physics, history, types and their manufacture, and application. Of especial interest are methods of fitting: moulage or casts, ophthalmometric measurement, Heimbald's sclerokeratometer (a device of numerous small rods in principle like the apparatus hatters use in fitting the head), and Strebel's rule and tables (which use as a basis a circular contact glass to find the scleral curvature).

The solutions most used are Ringer's and saline. Gifford's solutions are approved. Experiments indicate no need for a bubble in the solution to permit corneal respiration. Many cases of apparent intolerance are relieved by changing solutions. The appearance of halos after wearing a glass only means that the eye should be given a brief rest, and it is often relieved by changing solutions, as it arises from epithelial edema. Few serious consequences from contact glasses are mentioned in the literature.

A canvas of continental authors favored the Müller-Welt blown glasses over the Zeiss ground ones in theory; but the difficulties of fitting are much greater. Orthopedic claims for contact glasses are exaggerated, in the author's opinion. The literature tells of keratoconus cases showing improvement in the central opacity, corneal curvature, and astigmatism, as well as improvement in vision of the naked eye. The author's investigations do not confirm these as permanent changes. No well authenticated lowering of intraocular

tension in keratoconus was found. Use of an opaque contact glass with a small pupil over a clear part of the cornea is mentioned. In one case this was combined with optical iridectomy. (182 references.) Harmon Brunner.

Hecht, S., Peskin, J. C., and Patt, M. Intensity discrimination in the human eye. 2. The relation between $\Delta I/I$ and intensity for different parts of the spectrum. Jour. Gen. Physiology, 1938, v. 22, Sept., p. 7.

The authors describe a new apparatus for measuring visual-intensity discrimination over a large range of intensities, with white light and with selected portions of the spectrum. The procedure and measurements are given. The present numerical data, like most of the previously published data from various sources, are all described with precision by the theory which supposes that intensity discrimination is determined by the initial photochemical and chemical events in the rods and cones. (Table, graphs.) F. M. Cragg.

Holm, E., and Lodberg, C. V. Genealogic study of color blindness. Acta Ophth., 1939, v. 16, pt. 4, p. 524.

An analysis of nineteen color-blind patients in a family of three hundred individuals, among which is the case examined anatomically by Larsen (see Ophth. Year Book, 1924, v. 20, p. 225). Consanguinity was found in 30 percent of the color-blind. Ray K. Daily.

Jackson, Edward. Subjective study of visual aberrations. Amer. Jour. Ophth., 1939, v. 22, April, pp. 384-387; also Trans. Amer. Ophth. Soc., 1938, v. 36, p. 46.

Jaensch, P. A. Hereditary factors in myopia. Med. Klinik., 1939, v. 35, Jan. 20, pp. 69-71.

The author reviews the recent literature on the heredity of refractive errors, with special consideration of myopia. Myopia is not congenital, but has a congenital "anlage," and the influence of heredity is established beyond doubt. The mild degrees of myopia under six diopters seem to follow the dominant type of heredity, while the high and progressive types have been found in the majority of cases to be recessive. The degenerative changes in the macula and around the optic nerve, which are frequently associated with high myopia, are not to be interpreted as consequences of this myopia, but are identical with similar changes in the senile eye, and like these are hereditary. There are, however, factors, so far unknown, which influence and modify the picture of myopia in the individual case. These factors have to be sought in the environment and daily life of the individual. While we have no means of arresting progressive myopia, sight-saving classes have done much to minimize the handicap of such children, and it is proposed to place in such classes all offspring of families afflicted with progressive myopia, who have a myopia of over eight diopters.

Bertha A. Klien.

Litinskii, G. A. **The rapidity of depth perception.** *Viestnik Ophth.*, 1938, v. 13, pt. 6, p. 850.

A detailed report of an investigation based on the data obtained from one hundred test persons. The conclusions are that rapidity of depth perception runs parallel with acuity of depth perception. Training of pilots develops depth perception and increases its rapidity. Persons with orthophoria have no greater rapidity of depth perception than persons with heterophoria.

Ray K. Daily.

Rohr, Moritz. **On the development of spectacles with special reference to recent improvements.** *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 359.

Detailed observations regarding the general history of spectacles is given from the year 1600. Later the use of the center of rotation and its importance for the design of spectacle lens is described, and the development of symmetrical lenses of high collective power as made in Jena from 1908. A description of telescopic and contact lenses is given.

Beulah Cushman.

Rössler, Fritz. **Ten years experience with the Cobalt lamp, and new observations (spontaneous changes of astigmatism), in subjective tests of refraction.** *Klin. M. f. Augenh.*, 1939, v. 102, Feb., p. 176.

Since the author in 1927 reported his first attempts to determine the refraction of the eye by means of color dispersion, an essential improvement in the method has been made with the Cobalt lamp of Zeiss. Rössler now gives details of experiences and observations in a total of over 10,000 examinations.

C. Zimmermann.

Tscherning, M. **Concerning human vision.** *Oft. Selskab i Köbenhavn's Forhandler*, 1937-1938, pp. 8-12. In *Hospitalstidende*, 1938, Dec. 13.

There is a mechanism in the human eye by which the light of a light area in the field of vision tends to project itself, or rather to overflow, into a darker area, so that if fixation is prolonged the whole gives the appearance of a uniformly lighted area. This principle asserts itself in the elimination of the blind spot and the shadows of the retinal vessels from the normal field of vision. This also explains the fact that

the patient is sometimes not aware of blind areas in the field due to pathologic defects in the retina.

D. L. Tilderquist.

Williamson-Noble, F. A. Contact lenses considered from the clinical standpoint, with a survey of the results obtained. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 2, p. 535.

The author classifies the clinical indications as optical, occupational, and cosmetic. The optical group includes any surface irregularity of the pupillary area of the cornea, such as conical cornea, corneal facets, pemphigus, myopia, aniridia, albinism, and defective central vision.

The occupational indications include occupations in which fogging by steam or rain precludes the wearing of ordinary spectacles. In many recreations also, such as football, baseball, hunting, and shooting, they are of great advantage. Finally, if only used for cosmetic reasons they are very helpful. The results of a questionnaire to patients on the benefits and advantages are given.

Beulah Cushman.

4

OCULAR MOVEMENTS

Adrogué, Esteban. Disturbances of associated eye movements. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, Aug., p. 408.

A summary of our present knowledge concerning the anatomy, physiology, and pathology of the higher centers regulating associated movements of the eyes is given in some detail, together with a discussion of the clinical significance of disturbances of motility which fall in this category.

Edward P. Burch.

Anderson, J. R., and Mann, D. S. The orthoptic treatment of concomitant

convergent strabismus. *Med. Jour. Australia*, 1939, v. 1, Jan. 14, pp. 59-65.

A series of 81 cases of concomitant convergent strabismus treated by orthoptics in private practice is reported. Thirty-eight cases had normal retinal association when first seen and 43 had not. Twenty-four patients with normal association were treated by orthoptic training alone, of which 71 percent were cured, receiving an average training of 49 visits in 52 weeks. Ten patients in this group were treated by training and operation, 50 percent of them being cured by an average training of 67 visits in 95 weeks. Of the 43 patients with dissociation, 33 were treated by training alone, and 10 by operation alone. Of the 33 treated, 12 percent were cured and 21 percent almost cured.

T. E. Sanders.

Berens, Conrad. A new prism bar. *Amer. Jour. Ophth.*, 1939, v. 22, March, pp. 305-306.

Berens, Conrad. Tenon's capsule transplantation in surgery of the ocular muscles, with especial reference to post-operative deviations with adhesions between the muscles and the eyeball. *Trans. Amer. Ophth. Soc.*, 1937, v. 35, p. 173. (See *Amer. Jour. Ophth.*, 1938, v. 21, May, p. 536.)

Bielschowsky, A. Lectures on motor anomalies. 7. Paralysis: general symptomatology. *Amer. Jour. Ophth.*, 1939, v. 22, March, pp. 279-288.

Bielschowsky, A. Lectures on motor anomalies. 8. Paralysis of individual eye muscles: abducens-nerve paralysis. *Amer. Jour. Ophth.*, 1939, v. 22, April, pp. 357-367.

Cairns, Hugh. Peripheral ocular palsies from the neurosurgical point of

view. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 2, p. 464.

The author discusses his experiences with verified lesions of the oculomotor nerve. For the most part, expanding lesions within the orbit and cranium were found, and the clinical picture depended upon the speed with which the distortion was produced. (3 case reports, illustrations.) Beulah Cushman.

Cass, E. E. **Strabismus: abnormal retinal correspondence.** *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 276.

The author divides abnormal retinal correspondence into three groups. In the first, of alternators and cases of marked amblyopia, only false correspondence can be elicited. The second group occurs chiefly in squints with moderate amblyopia and an angle over ten degrees. The third group, much smaller, occurs in small-angle squints with either good vision in each eye or an amblyopia which is quickly improved by occlusion. Treatment of the first and second groups was for cosmetic purposes only, if congenital amblyopia was present. The alternators, if operated upon early with training afterward, usually recovered. The third group can get rid of the false correspondence by persistent training.

Beulah Cushman.

Jayle, Mingardon, and Labastie. **New contribution to the study of vestibular reactions in strabismus cases.** *Bull. Soc. d'Ophth. de Paris*, 1937, Oct., pp. 595-607.

Whirling tests were performed on 46 cases, which included each type of strabismus, two cases of spontaneous nystagmus, and two cases of spontaneous combined with latent nystagmus. Each variety of strabismus showed examples

of normal reactions. Cases showing clear-cut vestibular syndromes, of paralytic type, occurred in the monocular strabismus group. The origin, probably supranuclear, could condition the strabismus; no direct connection was found. (A preliminary report.)

Harmon Brunner.

Jayle, G. E., and Ourgaud, A. G. **The atypical syndrome of Foville.** *Arch. d'Ophth. etc.*, 1939, v. 3, Jan., p. 31.

The syndrome of Foville (paralysis of lateral gaze) consists of a complete or partial paralysis of gaze toward either side or sometimes toward both sides. As recovery progresses, nystagmus occurs, with large oscillations when the gaze is directed toward the affected side. Voluntary motility and automatic reflex motility are generally affected and classically in the same direction. Thus defined, the syndrome has an important localizing value, placing the lesion in the pons at the level of the nucleus of the oculomotor nerve and the posterior longitudinal bundle. There may or may not be an associated facial paralysis. Five cases showing more or less of the classical syndrome are described. Nystagmus played a major rôle in most of the cases, indicating that there was some disturbance of the oculo-labyrinthine pathways. For this reason the authors have called the syndrome presented an atypical Foville syndrome. They believe that it is of particular importance as a diagnostic sign of multiple sclerosis.

Derrick Vail.

Jung, Richard. **An electric method for multiple registration of nystagmus and other ocular movements.** *Klin. Woch.*, 1939, v. 18, Jan. 7, pp. 21-25.

The author describes in detail a convenient electric method for registration

of the horizontal and vertical components of the movements of both eyes simultaneously but independently of each other. The method utilizes the potential differences of corneoretinal potential, which are registered by oscillographs. It permits detailed analysis of normal and pathologic complex ocular movements, and its only disadvantage is the inability to register movements which do not exceed five degrees.

Bertha A. Klien.

Kiehle, F. A., and Henton, G. H. The results of squint operations: a review of the last 286 cases at the University of Oregon clinic. *Amer. Jour. Ophth.*, 1939, v. 22, April, pp. 422-423; also *Trans. Pacific Coast Oto-Ophth. Soc.*, 1938, 26th mtg.

Merlin, L. A. Method of testing muscle balance in ambulatory examinations. *Viestnik Ophth.*, 1938, v. 13, pt. 4, p. 552.

The author uses a stereoscope with appropriate charts. Ray K. Daily.

Miklos, Andor. Our experience with the Blaskovics squint operation. *Szemészet*, 1938, v. 1, Dec., p. 52.

The author reviews the results of 170 squint operations carried out according to the method of Blaskovics. He finds this method superior to all others, because myectomy can be exactly graduated, and because by tightening the sutures during aftertreatment an undercorrection can be improved or by removing the sutures earlier an overcorrection can be minimized. A further advantage of this method is that the operation can be done in one stage and it suffices to operate on one eye even if the angle of squint is very great. After myectomy the two eyes should appear parallel. After tenotomy a con-

vergent squint should be overcorrected four or five degrees, while a divergent squint should never be overcorrected. R. Grunfeld.

Schlaeppli, V. Essential congenital hyperfunction of the inferior oblique. *Bull. Soc. Franç. d'Ophth.*, 1938, v. 51, pp. 586-594.

The author describes the diagnostic schema used to define paralyses and contractures of the vertical muscles of the eye, plotting the vertical excursions of the double images in degrees. Disappearance of the head tilting and vertical divergence are to be noted in pictures taken before and after tenotomy.

Clarence W. Rainey.

Stenius, Sten. Remarks on strabismus and its treatment in children. *Acta Ophth.*, 1938, v. 16, pt. 4, p. 550.

An analysis of fifty cases of concomitant convergent strabismus observed over a period of three years. Refraction and treatment for amblyopia secured binocular vision only in cases of periodic strabismus. Ray K. Daily.

Szymanski, J. Subconjunctival rectus-muscle shortening. *Klinika Oczna*, 1938, v. 16, pt. 6, p. 756.

A fold of muscles is clamped with forceps and tied with two sutures. The fold is cut off and the conjunctival wound closed. (Illustrations.)

Ray K. Daily.

5

CONJUNCTIVA

Andrade, Lopez de. Studies on trachoma. *Ann. d'Ocul.*, 1939, v. 176, Jan., pp. 33-40.

Intraocular rabbit inoculation with fresh trachoma material as described by Szily was repeated with similar result. Of 30 patients studied, 18 had definite

trachoma, and 12 had other conjunctival diseases. The trachomatous patients had marked lymphocytosis but did not show any significant eosinophilia. Trachomatous patients had no definite hypocalcemia and no alteration in alkaline reserve.

John M. McLean.

Attiah, M. A. H., and El Tobgy, A. F. **Factors influencing course of trachoma.** Bull. Ophth. Soc. Egypt, 1937, v. 30, p. 137.

Variations in individual and racial resistance, acquired immunity, and seasonal exacerbations of trachoma are discussed. The occurrence of exacerbations in trachoma coincides with certain seasonal epidemics of acute ophthalmias and certain seasonal climatic changes. Cases of trachoma which are so mild as to give no symptoms become acute when secondary bacterial infection occurs. Treatment of such bacterial infection transforms the severe type of trachoma into a mild form. Secondary infection of the meibomian glands is a potent source of continuous corneal irritation. Another accessory factor in trachomatous keratitis is allergy to tuberculo-protein.

Edna M. Reynolds.

Bencini, Alberto. **"Essential" shrinking of the conjunctiva.** Boll. d'Ocul., 1938, v. 17, May, pp. 313-336.

A man 69 years of age had shown for fifteen years symptoms of chronic catarrhal conjunctivitis, with photophobia, trichiasis, and corneal ulcers. Both lower lids had become partially adherent to the eyeball. There was keratinization of the bulbar conjunctiva, with corneal vascularization and pterygium-like formations. Another man, aged 48 years, showed a dry, thick, lower palpebral conjunctiva and shallow fornix. The cornea was vascular-

ized and opaque, with symblepharon at the external end of each lid on both eyes. Histologic examination of conjunctiva, skin, and lids showed epithelial changes with a slight inflammatory reaction in the conjunctiva, and with more marked changes in the dermis of the skin and lids due to poorly defined factors. (Bibliography, 3 tables, 12 colored figures.)

M. Lombardo.

Blegvad, Olaf. **Pemphigus of the conjunctiva and of the mouth.** Oft. Selskab i Köbenhavn's Forhandling, 1937-1938, pp. 1-4. In Hospitalstidende, 1938, Dec. 13.

In a case of chronic pemphigus of the conjunctiva there were acute manifestations of the same disease on the mucous membranes of the mouth and throat.

D. L. Tilderquist.

Bower, A. G., and Frank, W. **Treatment of gonorrheal ophthalmia.** Amer. Jour. Ophth., 1939, v. 22, March, pp. 277-278.

Burnier, Penido. **Trachoma and its treatment with sulphanilamide.** Rev. de Oft. de São Paulo, 1938, v. 6, Oct.-Nov.-Dec., pp. 214-220.

The author gives an analysis of thirty cases so treated. The results were generally good, with rapid diminution in photophobia, lacrimation, secretion, and blepharospasm. (Discussion.)

W. H. Crisp.

Cornet, Emmanuel. **True and false papillary conjunctivitis.** Ann. d'Ocul., 1939, v. 176, Feb., pp. 100-102.

From conditions which simulate it, true papillary conjunctivitis may be distinguished by attempting to express the excrescences. There are three types of true papillary conjunctivitis: papillary vernal conjunctivitis, papillary syphilitic conjunctivitis, and papillary

conjunctivitis secondary to chronic irritation of the conjunctiva or lacrimal passages. False papillary conjunctivitis or pseudopapillary conjunctivitis is divided into infiltrating pseudopapillary trachoma and granular pseudopapillary trachoma. In both of these the lesions may be crushed and expressed, proving the differential diagnosis.

John M. McLean.

Dulewiczowa, M. *Surgical therapy of trachoma*. *Klinika Oczna*, 1938, v. 16, pt. 6, p. 971.

A review of the literature.

Ray K. Daily.

Greene, L. S., and Perry, M. W. *Erythema nodosum with nodules in the conjunctivae*. *Amer. Jour. Ophth.*, 1939, v. 22, April, pp. 389-391.

Hirschfelder, Max. *Treatment of trachoma with sulphanilamide*. *Amer. Jour. Ophth.*, 1939, v. 22, March, pp. 299-300.

Katznelson, A. B., and Pris, I. I. *Phlyctenular ocular diseases and tuberculosis*. *Viestnik Opht.*, 1938, v. 12, pt. 4, p. 447.

On the basis of 270 cases of phlyctenular keratoconjunctivitis, the author comes to the following conclusions. Tuberculous etiology may be considered established on the basis of clinical and roentgenologic findings as well as on tuberculin reactions. The majority of cases of phlyctenular conjunctivitis occur between one and eleven years of age, and females are affected more frequently than males. The majority of the patients have clinical and roentgenologic changes, active in character in two thirds of the cases. In all cases, even in the absence of clinical signs, there is a high sensitivity to tuberculin, although there is no parallelism

between the intensity of the disease and that of the tuberculin reaction. The younger the patients, the greater the percentage with clinical symptoms. Among the active forms of tuberculosis the infiltrative type predominates. The presence of cavernous changes makes the prognosis of the ocular infection more grave. Active clinical tuberculosis is most frequently found in cases of avascular keratitis, less frequently in pannus, and in 50 percent of cases of phlyctenular conjunctivitis. Phlyctenules at the limbus, and avascular keratitis, are early manifestations of tuberculosis. Pannus develops after recurrent attacks and is therefore seen in older people. Exacerbations of pannus keratitis are less dependent on the toxicity of the tuberculous focus than are other forms of phlyctenulosis. Phlyctenular keratoconjunctivitis is frequently the only symptom of active tuberculosis and it should lead to early diagnosis of the disease.

Ray K. Daily.

Khalil, M. *Treatment of trachoma*. *Bull. Ophth. Soc. Egypt*, 1937, v. 30, p. 151.

A brief outline of the author's method of treatment of all stages of trachoma is given.

Edna M. Reynolds.

Koch, F. L. P. *Ocular pemphigus*. *Amer. Jour. Ophth.*, 1939, v. 22, March, pp. 300-304.

Lyons, F. M. *The biomicroscopy of spring catarrh*. *Giza Mem. Ophth. Lab.*, 1937, 12th ann. rept., Appendix no. 2, pp. 1-13.

The author describes in detail the different types of palpebral and bulbar spring catarrh and explains their development. His observations on the bulbar forms provide an explanation of the minute anatomy at the limbus (such as the "secondary groove" and keratitis

epithelialis vernalis). The initial and all-important feature of the disease is an abnormal exudation of fibrin and wandering cells from certain groups of the conjunctival capillaries. Connective-tissue hyperplasia is not a primary feature of the disease. The form each lesion takes depends upon the structural characteristics of the site involved and the degree of capillary leakage. The etiology is still unknown, but the characteristic diagnostic signs of spring catarrh are: bright glistening appearance of the tarsal conjunctiva, fine sticky filaments or membrane which can be removed from the tarsus, itching of the lids, general pallor of the patient, and conjunctival eosinophilia. The latter in itself is not diagnostic unless found in conjunction with the fibrinous discharge. Lawrence G. Dunlap.

Mathis, Giovanni. Bacteriology of the conjunctiva of myxomatous rabbits. *Rassegna Ital. d'Ottal.*, 1938, v. 7, Sept.-Oct., pp. 661-665.

Rabbits suffering from myxoma develop an intense conjunctivitis with chemosis, abundant secretion, blepharitis, and so on. The author studied bacteriologically twenty rabbits which had been injected with myxomatous virus. The organisms found were staphylococcus aureus and albus, micrococcus tetragerus, and streptococcus. He concludes that the bacteria are in no way specific. Eugene M. Blake.

Medunina, I. I. Keratoconjunctivitis in hypofunction of the lacrimal glands. *Viestnik Opht.*, 1938, v. 13, pt. 5, p. 655.

A review of the literature and a report of a case of conjunctivitis sicca with diminished lacrimal secretion. All forms of therapy recommended for this affliction were ineffective in this case.

Ray K. Daily.

Meyerhof, Max. Remarks on trachoma healing without visible scar formation. *Bull. Ophth. Soc. Egypt*, 1937, v. 30, p. 145.

Many cases of trachoma which healed without treatment and with very superficial conjunctival scarring are cited. Healing with very slight scarring can be obtained by daily superficial scraping of the conjunctiva followed by gentle rubbing with 1 to 1,000 bichloride of mercury, argyrol, or a hypertonic solution of copper sulphate. Edna M. Reynolds.

Paez Allende, Francisco. Pterygium. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, Aug., p. 438.

This is a brief outline of the surgical management of pterygium according to the technique of Duverger, which the author has employed in 71 cases.

Edward P. Burch.

Pages, Duguet. Sulphanilamide in gonococcic blennorrhoea. *Bull. Soc. d'Opht. de Paris*, 1938, no. 2, Feb., p. 94.

The results were rather uniformly good. In discussion Terrien urges that usual local measures be continued in every case, because of the danger of corneal complications. The dose should be close to the tolerance level of the individual. Harmon Brunner.

Porsaa, K. Xerosis of the conjunctiva not due to avitaminosis. *Oft. Selskab i Köbenhavn's Forhandlinger*, 1937-1938, pp. 32-35. In *Hospitalstidende*, 1938, Dec. 13.

In opposition to the general theory that xerosis of the conjunctiva is due either to injuries, such as burns, or to a lack of vitamins, two case reports of xerosis in healthy and well nourished adults are given. In both, there was a triangular dry area of the conjunctiva,

temporal to each cornea, which corresponded to what is described under the name of Bitot's plaques. The spots were of long duration, gave no symptoms, were not progressive, and did not stain with any dyes. Dark adaptation was normal. Both patients had been treated for long periods with vitamins, without result. The author's theory is that these spots were due to absence of the normal beaker cells which furnish a great portion of the moisture to the conjunctiva.

D. L. Tilderquist.

Prettin, Heinz. Uliron, a new remedy for gonorrheal conjunctivitis. *Klin. M. f. Augenh.*, 1939, v. 102, Jan., p. 114.

In a very severe case of gonorrheal conjunctivitis with infiltration of the cornea, at the age of 29 years, the author had excellent results from this drug.

C. Zimmermann.

Prigozina, A. I. Clinical and morphological allergic reactions in the conjunctiva. *Viestnik Ophth.*, 1938, v. 13, pt. 6, p. 766.

A review of the literature and a report of three cases with micropathologic studies. The conclusions are that phlyctenules and fleeting nodules are the manifestations of varying phases of local allergy. In low sensitivity the pathology is that of inflammation and infiltration, and in high sensitivity that of an aseptic necrosis. The pathogenesis of these changes is closely related to tuberculous allergy, but in some cases may be non-specific in character. In such cases, in addition to the conjunctival affection there is always an edema or hyperemia of the mucous membrane of the upper respiratory tract, unilateral if only one eye is diseased. Not infrequently there is a disturbance in the swallowing reflexes. The corneal sensitivity is also reduced, sometimes only

in the diseased eye, but more frequently in both eyes. The efflorescences are located superficially in the cornea and in the mucous membranes. Hemograms show slight leucocytosis and sometimes a shift to the left, with absence of eosinophilia. Neurologic examination reveals a vegetative neurosis. In this type of case tuberculin therapy, in small doses, is provocative of anaphylactic symptoms. The pathologic anatomy of the tissue excised for biopsy shows a granulomatous reaction in the form of an epithelioid nodule with a tuberculous structure. (Photomicrographs.)

Ray K. Daily.

Reitsch, W. Rhythmic and other practical symptoms for the diagnosis of diplococcus infection. *Klin. M. f. Augenh.*, 1939, v. 102, Jan., p. 112.

Exacerbations, pain, and impairment of sight in the evening are said to be characteristic signs of diplococcus conjunctivitis.

C. Zimmermann.

Stewart, F. H. Experimental pathology of trachoma. *Giza Mem. Ophth. Lab.*, 1937, 12th ann. rept., Appendix no. 1, pp. 1-27.

Stewart deals with microscopy of trachoma, virulence, filtrability of the trachoma virus, attempts to grow the virus on the chorio-allantoic membrane of the hen, purification of the virus, attempted culture of media containing cells, and transmission of trachoma by lice and flies. He states that elementary granules are not infective, although Thygeson and others have been able to induce genuine trachoma in the human with a filtrate containing only elementary bodies. Stewart also states that the infection is carried by the initial body and not by the smaller elementary bodies. In Egyptian trachoma free initial bodies are rarely seen. In

1937 Stewart found free initial bodies in only 7 of 37 cases, but he found the secretion from one lid sufficient to infect anywhere from 20 to 384 animals. Inclusions can be found in 100 percent of early cases of Egyptian trachoma, but elementary granules are not so numerous in Egyptians as in American Indians.

There is considerable evidence that the infectivity of trachoma is either due to or connected in some way with the elementary body, so that conflicting conclusions regarding the filtrability of trachoma virus are probably due to the fact that successful transmission depends largely on virulence and virus concentration.

Stewart used the most susceptible experimental species, the baboon, whereas in other countries *Macacus rhesus* and *Macacus inuus* are used. From this the conclusion is drawn that the virulence of trachoma virus in Egypt is lower than elsewhere. The author also concludes that trachoma is spread by direct contact, and is not transmitted by flies and lice unless the virus is transferred mechanically.

Lawrence G. Dunlap.

Wilson, R. P. **Sulphonamide chemotherapy of trachoma.** Giza Mem. Ophth. Lab., 1937, 12th ann. rept., pp. 103-105.

Ten children with well marked trachoma of stages I to II a-b, all with pannus tenuis but no active keratitis and very little evidence of mixed infection, were treated with prontosil rubrum (Bayer) with no apparent effect upon the disease.

Lawrence G. Dunlap.

6

CORNEA AND SCLERA

Bessemens, A., and Van Canneyt, J. **Ocular tissue temperatures in the nor-**

mal rabbit and in the rabbit affected with syphilitic keratitis. Arch. d'Ophth. etc., 1939, v. 3, Jan., p. 18. (See Section 17, Systemic diseases and parasites.)

Dalsgaard-Nielsen. **Correlation between syphilitic interstitial keratitis and deafness.** Acta Ophth., 1938, v. 16, pt. 4, p. 635.

The material consisted of 175 cases. Its analysis shows that 15.6 percent of cases with interstitial keratitis develop deafness; that the interval between the keratitis and onset of deafness varies from one to 31 years; and that deafness develops more frequently in patients in whom the keratitis runs a severe course.

Ray K. Daily.

Friede, Reinhard. **On congenital endoderm-mesoderm hypoplasia of the eye and its relation to congenital cornea plana.** Klin. M. f. Augenh., 1939, v. 102, Jan., p. 16.

Hitherto cornea plana has been considered an independent malformation of the limbus and its immediate surroundings. After a critical review of all extant cases of endodermal, mesodermal, and ectodermal disturbance the author concludes that congenital cornea plana is a developmental disturbance which may involve all mesodermal parts of the eye in greater or lesser degree. Hypoplasia of the ectoderm is almost always combined with it in the form of severe amblyopia or even amaurosis. The underdevelopment of the endoderm is considered as primary, that of the mesoderm as secondary. The time of origin is probably the third or fourth embryonic month, and the cause a damage to primarily normal germ plasm. Hereditary transmission may be dominant.

C. Zimmermann.

Gunderson, Trygve. **Results of autotransplantation of cornea into anterior**

chamber. *Trans. Amer. Ophth. Soc.*, 1938, v. 36, p. 207. (See *Amer. Jour. Ophth.*, 1939, v. 22, March, p. 322.)

Kamel, A. Tebeprotein in diagnosis and treatment of certain eye diseases. *Giza Mem. Ophth. Lab.*, 1937, 12th ann. rept., pp. 100-103.

To determine the extent to which tuberculous allergy is a factor in certain Egyptian eye diseases and the effect of tebeprotein treatment upon cases showing tuberculous allergy, tebeprotein was given subcutaneously each week in nine of eighteen cases of recurrent corneal infiltration. Four cases had no recurrences after two to seven months of injections, and the remaining five cases had only mild recurrences and were all cured except one. Recurrences were brought about by trauma (painting of the lids with 1-percent mercury bichloride, expression of follicles, removal of concretions). Nineteen percent of the patients seen at the Giza Ophthalmic Hospital showed positive Mantoux tests, and the opinion is that recurrent corneal infiltrations are not trachomatous.

Different forms of keratitis profunda were also treated with tebeprotein, two with good results. Sclerokeratitis was similarly treated with clearing in the one case which completed the treatment. Episcleritis fugax appeared to respond well, as did iridocyclitis when given sufficient treatment.

Lawrence G. Dunlap.

Kayser, B. On the impossibility of close genetic relations between macrocornea or megalocornea and hydrophthalmos. *Klin. M. f. Augenh.*, 1939, v. 102, Jan., p. 11.

Kayser contests the conclusion by vom Hofe (*Klin. M. f. Augenh.*, 1938, v. 101, p. 105) that close genetic rela-

tions must exist between macrocornea and hydrophthalmos, because it has not been proved that macrocornea existed in his cases. Macrocornea and megalocornea are purely primary anomalies of growth and not pathological. The enlargement of the cornea in vom Hofe's hydrophthalmos families is easily explained as secondary to a fetal hydrophthalmos followed by partial arrest and later recrudescence.

C. Zimmermann.

Klar, R. Observations and investigations on the diffusion of fluorescein in human and animal eyes. *Klin. M. f. Augenh.*, 1939, v. 102, Jan., p. 29.

Klar observed diffusion of aqueous solutions of fluorescein after instillation in the conjunctival sacs of patients with deep inflammatory corneal processes caused by external influences such as cauterization or explosion, or ulcers of varying causation. In experiments on the dog, rabbit, and monkey the fluorescein appeared in the anterior chamber after a half hour, by diffusion through the cornea (whether or not the latter had been previously injured), whereas fluorescein was never observed in the human anterior chamber after repeated instillations of the solution into the healthy conjunctival sac, in 0.5 to 5-percent strength. A 10-percent solution instilled about five times per hour penetrated the intact human cornea without causing irritation. In the human cases in which the parenchyma of the cornea had been damaged, diffusion of a 0.4-percent solution occurred.

C. Zimmerman.

Maghraby, A. A. M. El. Biomicroscopy of deep keratitis. *Bull. Ophth. Soc. Egypt*, 1937, v. 30, p. 165.

A review of the slitlamp findings in 54 cases of deep keratitis is given.

Edna M. Reynolds.

Posthumus, R. G. Megalocornea in relation to other anomalies in members of the same family. *Klin. M. f. Augenh.*, 1939, v. 102, Jan., p. 1.

Posthumus studied the genealogic tree of a family and describes three cases of megalocornea. He found that in these latter the eyeball was not enlarged, although the vitreous might be atrophic and the iris might show destruction of pigment. Especially the male members had hair lacking in pigment. Some of the patients had typical receding skull formation and slight mental debility. Megalocornea may occur familiarly in relation to labyrinthine deafness and diabetes, the men inheriting the megalocornea, the women diabetes, and both deafness.

C. Zimmermann.

Reitsch, W. Cauterization of the cornea with non-glowing cautery. *Klin. M. f. Augenh.*, 1939, v. 102, Feb., p. 253.

A much less intense temperature than the 525 degrees Celsius of the dully glowing platinum wire is sufficient. It avoids destruction of the surrounding healthy cornea, and change of curvature from deep cauterization. The author makes the application between the objective of the corneal microscope and the patient's eye, and not nearer to the cornea than can be tolerated by the anesthetized eye without a sense of heat.

C. Zimmermann.

Riad, Mahmoud. Some observations on trachoma of cornea. *Bull. Ophth. Soc. Egypt*, 1937, v. 30, p. 159.

Following a description of the histologic structure of the cornea and the limbal vessels, the corneal changes occurring in all stages of trachoma are described and illustrated by slitlamp drawings and photomicrographs.

Edna M. Reynolds.

Vogt, A. A further histologic picture of wavy folding of the parenchymatous lamellae at the apex of keratoconus. *Klin. M. f. Augenh.*, 1939, v. 102, Jan., p. 28.

Anatomic examination of the apex of a keratoconus of a man of sixty years showed within the thinnest portion a waving of the parenchymal lamellae, representing the substratum of the keratoconus lines, as in a case reported by Vogt.

C. Zimmermann.

7

UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Barsoum, Labib. A case of congenital cyst in anterior chamber of left eye with congenital anterior capsular cataract in both eyes. *Bull. Ophth. Soc. Egypt*, 1937, v. 30, p. 195.

Such a case is reported. The origin of the cyst was probably the pigmented epithelium of the iris from which it became separated to lie free in the anterior chamber. Edna M. Reynolds.

Blegvad, O. The diagnosis of Boeck's iritis. *Acta Ophth.*, 1939, v. 16, pt. 4, p. 598.

The author disagrees with Osterberg, who contends that morphologically Boeck's iritis cannot be differentiated from tuberculous iritis. This applies to the serous type, which has no distinguishing characteristics outside of its frequent association with band keratitis. The nodular form, however, differs in appearance from a tuberculous nodule. The latter is smooth, dirty-white with a yellow tinge, and round or oval in form. It pushes forward through the iris tissue and is enveloped by blood vessels. After healing, the small nodules leave almost invisible scars, while the large ones leave atrophic areas in the iris tissue. In Boeck's iritis the nodules are frequently

large, irregular in contour and surface, reddish-yellow in color, and traversed by numerous fine blood vessels. They heal without atrophy or scars.

Ray K. Daily.

Blegvad, O. Tuberculous iridocyclitis. *Oft. Selskab i Köbenhavn's Forhandler*, 1937-1938, pp. 35-45. In *Hospitalstidende*, 1938, Dec. 13.

The author's presentation is based on the experiences with this disease at the Finsen Institute. As to diagnosis, he emphasizes the finding of tubercles in the iris. If these are present, differentiation must be made from three other types of iritis: (1) luetic, (2) metastatic glioma, and (3) Boeck's sarcoid. If no tubercles of the iris are found the diagnosis must be made by exclusion. For treatment the writer depends on injections of tuberculin in progressively increasing doses, and the use of ultraviolet light for one hour daily. He reports very encouraging results.

D. L. Tilderquist.

Jancke, G. Formation of cysts in the iris after inflammation. *Klin. M. f. Augenh.*, 1939, v. 102, Feb., p. 248.

A woman of 38 years showed cysts in the atrophic iris. In very early life she had had iritis accompanying luetic parenchymatous keratitis.

C. Zimmermann.

Meyer, F. W. Ocular tuberculosis and benign lymphogranulomatosis. (Boeck's sarcoid, multiple benign military lupoid). *Klin. M. f. Augenh.*, 1939, v. 102, Jan., p. 76.

The histologic findings in an excised piece of skin from a case of retinochoroiditis and a glandular affection in a case of severe iridocyclitis, which are described in detail, confirmed the diagnosis of lymphogranulomatosis. This suggested a tuberculous etiology of the ocular affections. C. Zimmermann.

Robertson, J. D. The fluid equilibrium of the body and its relation to the eye. *Brit. Jour. Ophth.*, 1939, v. 23, Feb., pp. 106-124.

In an article not lending itself well to abstraction the author demonstrates that dialysis is not a satisfactory explanation of the production of the aqueous humor; that the formation of this fluid is not governed by the simple laws which govern lymph; that when the osmotic equilibrium in the body is disturbed the fluid in the eye is similarly disturbed; that aqueous humor circulates from the posterior to the anterior chamber; that evidence places the formation of the aqueous humor in the ciliary process, and that the fluid leaves the eye by some process that is not osmosis, with no fluid leaving the eye normally by the posterior chamber. These conclusions substantiate former studies by the author. (See *Amer. Jour. Ophth.*, 1937, v. 20, p. 1166, and 1938, v. 21, p. 705.) (Figures, references.) D. F. Harbridge.

Robertson, J. D., and Williams, P. C. The creatinine, sugar, and urea equilibrium between plasma and lymph, aqueous humor, cerebrospinal fluid, and gastric secretion after a hypertonic injection of these solutions. *Jour. of Physiology*, 1939, v. 95, Feb. 14, pp. 139-147.

A hypertonic solution of glucose, urea, and creatinine was injected intravenously into cats, and determinations of these substances were made on blood, lymph, gastric secretion, cerebrospinal fluid, and aqueous humor. The concentrations of these substances reach an equilibrium in blood and lymph, but at no time amount to even 50 percent of the blood values in the cerebrospinal fluid and aqueous. This is regarded as further evidence that these fluids are not simple filtrates of blood

plasma. However, analysis of aqueous reformed after evacuation of the anterior chamber shows values comparable to lymph, and indicates that in such instances the aqueous does resemble a filtrate of the blood.

George A. Filmer.

Vogt, Alfred. The histology of iris efflorescences (iris tuberculids) in scrofulous iridocyclitis. *Klin. M. f. Augenh.*, 1939, v. 102, Feb., p. 246.

Vogt describes and illustrates efflorescences of the pupillary border in pieces of iris excised on account of secondary glaucoma in a man of fifty years and in a woman of 44 years. Histologically they showed foci containing lymphocytes, epithelioids, and giant cells, and occasional caseation.

C. Zimmermann.

8

GLAUCOMA AND OCULAR TENSION

Azmy, Youssef. The normal ocular tension. *Bull. Ophth. Soc. Egypt*, 1937, v. 30, p. 5.

Examination with the Schiötz tonometer of one hundred normal eyes in patients from five months to 55 years of age showed an average tension of 22.4 mm. Hg. The lowest limit was 17 mm. Hg, and the highest 30 mm. Hg.

Edna M. Reynolds.

Bakly, M. A. El. Surgical treatment of glaucoma. *Bull. Ophth. Soc. Egypt*, 1937, v. 30, p. 65.

Methods of reducing high tension before operation are outlined. The indications for and the technique of the following operations are given: iridectomy, anterior sclerotomy, posterior sclerotomy, Lagrange sclerectomy, Elliot's sclero-corneal trephining, cyclodialysis, iridotaxis, iridencleisis, seton drainage, incision of the angle of the

anterior chamber, and Barkan's operation on Schlemm's canal. The routine treatment followed with cases of glaucoma in the ophthalmic hospitals of Egypt is stated. Edna M. Reynolds.

Bergler, Karl. On trephine-cyclodialysis. *Klin. M. f. Augenh.*, 1939, v. 102, Jan., p. 49.

The author describes his modification of the technique of Sallmann (see *Amer. Jour. Ophth.*, 1935, v. 18, p. 876), to which he refers, and reports his experiences with trephine-cyclodialysis in 45 cases of glaucoma (25 single, 9 chronic inflammatory, 3 acute, 8 secondary). He concludes that this operation is a valuable addition to glaucoma therapy. It is preferable to classical cyclodialysis for its greater technical simplicity and its rapid and usually durable effect. The manipulation of the spatula for detaching the ciliary body is possible over a greater area through the trephined hole. This explains the lasting benefit, as only an extensive detachment of the ciliary body gives the best possible result. C. Zimmermann.

Custodis, Ernst. Unilateral hereditary hydrophthalmos and its hereditary succession. *Klin. M. f. Augenh.*, 1939, v. 102, Feb., p. 242.

Three sisters and two brothers of the patient had normal eyes; one brother and the patient had left hydrophthalmos. The patient was twice operated upon. He has four children of whom the only boy, aged 2½ years, showed soon after birth enlargement of the right eye for which he had been operated upon six months before the present examination. A digenic dominant heredity seemed probable. The author is against sterilization for such cases if it cannot be proved by further study that unilateral hydrophthalmos fre-

quently occurs bilaterally in the descendants. C. Zimmermann.

Evans, J. J., and Evans, P. J. Ocular changes associated with nevus flammeus. *Brit. Jour. Ophth.*, 1939, v. 23, Feb., pp. 95-105. (See Section 11, Optic nerve and toxic amblyopias.)

Friedenwald, J. S. Contribution to the theory and practice of tonometry. 2. An analysis of the work of Professor S. Kalfa with the applanation tonometer. *Amer. Jour. Ophth.*, 1939, v. 22, April, pp. 375-381.

Griscom, J. M. A modification of the Lagrange operation for simple glaucoma—results of the operation in 50 unselected cases. *Pennsylvania Med. Jour.*, 1939, v. 42, March, pp. 640-642.

The author considers that the greatest technical difficulty in the original Lagrange operation for simple glaucoma is in making the scleral section satisfactorily. He describes a modification of the operation in which the scleral flap is made first. A broad conjunctival flap is dissected to the limbus and held down by an assistant. With a cornea-splitting knife an incision 3 mm. long is made in the superficial layers of the sclera, 2 mm. above and parallel to the limbus. The point of a keratome is introduced into this scleral incision and is passed into the anterior chamber at the angle. The keratome is advanced over the anterior surface of the iris until the scleral incision is about 5 mm. wide, and then is quickly withdrawn. Next a piece of the scleral lip 1.5 mm. wide and 4 mm. long is excised. Finally a broad basal iridectomy is done and the conjunctiva sutured.

The author reports the results of this operation performed on fifty unselected, previously unoperated cases of simple glaucoma during the preceding nine

years. In 45 cases, or 90 percent of the total, tension was reduced to within normal limits. In one case the operation was a failure, from prolapse of the ciliary body. In two cases the tension remained high, and in two other cases a moderate hypotension resulted. In no case did postoperative iridocyclitis or infection occur. (Discussion.)

George A. Filmer.

Ibrahim, F. G. Syphilis among glaucomatous cases. *Bull. Ophth. Soc. Egypt*, 1937, v. 30, p. 40.

In a routine examination of 220 cases of glaucoma, 38 cases of syphilis were found, while among 142 patients with senile cataract, only 19 cases of syphilis were found. The author believes that syphilis may be one of the predisposing causes of primary glaucoma.

Edna M. Reynolds.

Ibrahim, S. A. The value of cyclodialysis operation in glaucoma. *Bull. Ophth. Soc. Egypt*, 1937, v. 30, p. 87.

A modification of Heine's cyclodialysis is described. It was found to give good results in the following types of case: (1) in chronic uncompensated glaucoma in which iridectomy had failed; (2) in cases of secondary glaucoma with adherent leucoma which had been operated upon unsuccessfully; (3) in cases of partial and total anterior staphyloma; (4) in cases of tattooing of corneal leucomas requiring an iridectomy before the tattooing; and (5) in cases of hypertension following successful extraction of the lens.

Edna M. Reynolds.

Jeandelize, P., Drouot, P. L., Thomas, C., and Bardelli, N. Ocular tension, glaucoma, and the hypophysis. *Bull. Soc. Franç. d'Ophth.*, 1938, v. 51, pp. 478-484.

Surveying the literature on the subject, the authors found that the ocular tension was low in states characterized by increased activity of the hypophysis, such as pregnancy, acromegaly, adiposo-genital syndrome, and Simmonds' disease, and was elevated in cases where the X rays demonstrated certain changes in the sella turcica. The hypophyseal extracts, especially those of the posterior portion, seemed to have a hypotensive effect in glaucoma. Partial hypophyseal removal, and the anterior hypophyseal extracts, caused hypertensive effects.

Clarence W. Rainey.

Kattan, M. A. El. **A brief comment on the pathological course of glaucoma.** Bull. Ophth. Soc. Egypt, 1937, v. 30, p. 17.

Since the intraocular fluids are a dialysate from the capillary blood, the tension of these fluids depends on intracapillary pressure in the choroid and ciliary body. This is maintained by regulation through the sympathetic nervous system. Normally a wave of increased blood pressure would stimulate the sympathetic system and produce contraction of the blood-vessel walls, thus guarding the normal intracapillary pressure. An aberration of this regulating mechanism or an increase in the permeability of the capillary walls such as we get in certain toxic conditions would allow the passage of large quantities of fluid. Edema thus set up in the vitreous pushes the lens, iris, and ciliary body forward, shutting the filtering angle. As a result of repeated attacks, the mere physical contact between the periphery of the iris and the cornea ends in gluing together of these two surfaces by exudate.

Recession of the lamina cribrosa in mild hypertension cases is explained as

due to traction from behind, with a fibrosis following cavernous atrophy of the optic-nerve fibers. A brief discussion of exfoliative glaucoma capsularis is given. Edna M. Reynolds.

Khalil, Mohammed. **Lagrange's operation for glaucoma modified.** Bull. Ophth. Soc. Egypt, 1937, v. 30, p. 79.

The Lagrange operation is used by the author for all types of glaucoma. The operation is modified by making a large conjunctival flap as in trephining, and then undermining the conjunctiva above the wound posteriorly in order to secure a larger space for direct filtration of the aqueous.

The Lagrange operation is preferred to the Elliot because (1) the iridectomy can be done more easily, (2) a linear gap in the sclera gives more extensive filtration, and (3) the limbus is left free for subsequent cataract extraction if necessary. Levoglucosan or atropine is used postoperatively to prevent posterior synechiae.

Edna M. Reynolds.

Lottrup-Andersen, C. **Adrenalin treatment of glaucoma simplex.** Acta Ophth., 1939, v. 16, pt. 4, p. 611.

The author is very enthusiastic about the effectiveness of adrenalin tampons in reducing intraocular pressure. (11 case reports.) Ray K. Daily.

Maghraby, A. **Glaucoma capsularis.** Bull. Ophth. Soc. Egypt, 1937, v. 30, p. 42.

The clinical findings in 19 cases of capsular glaucoma are reported. This condition plays a part in 8 to 12 percent of glaucoma cases. Its onset is insidious with no acute symptom, only a sense of heaviness and discomfort which rarely ceases and is accompanied by gradual failure in vision. Without slitlamp examination, the cases pass as simple

immature cataract and are told to wait for maturity and extraction of the cataract. The failure in vision is due (1) to the slight increase of tension commonly present and (2) to varying amounts of lens opacity. Visual acuity in the cases reported ranged from 60/60 to 6/36. The disease usually occurs in older people. The average age in this group was 65 years.

Sixteen of the 19 cases showed increased tension, the highest reading being 45 mm. Hg and the other cases varying from 5 to 10 mm. above normal. The limits of normal tension in these cases are lower than in ordinary glaucoma. A tension of 22 to 25 mm. Hg is high when associated with exfoliation of the lens capsule. The outstanding feature when viewed with the slitlamp is the bluish-white fluffy masses attached to the pupillary border of the iris. Exfoliation of the superficial lamellae of the lens capsule is the second outstanding feature of the disease. It is seen as fine bluish-white scales on the anterior surface of the lens. Histopathologic examination of excised iris tissue shows slight atrophy with hyaline thickening of blood vessels. Lightly stained reticular masses occur at the pupillary border and in the furrows on the posterior surface of the iris.

Broad iridectomy is the operation of choice for treatment. Although tension may be restored to normal, gradual failure of vision occurs because of the accompanying lens opacity.

Edna M. Reynolds.

Massoud, Farid. Extraocular influence in glaucoma. *Bull. Ophth. Soc. Egypt*, 1937, v. 30, p. 32. (See *Amer. Jour. Ophth.*, 1938, v. 21, Jan., p. 82.)

Maziny Be, E. H. El. Statistical review on glaucoma. *Bull. Ophth. Soc. Egypt*, 1937, v. 30, p. 1.

The percentage of glaucoma cases among the patients examined in the ophthalmic hospitals of Egypt shows a steady decline from 1921 (1.77 percent) to 1935 (0.73 percent). This is attributed to increased familiarity of the general population with the ophthalmic hospitals, resulting in earlier care of patients and consequent reduction in the incidence of glaucoma.

Edna M. Reynolds.

Mohamed, I. A. Synopsis on the pathology of glaucoma. *Bull. Ophth. Soc. Egypt*, 1937, v. 30, p. 22.

The fact that increased tension is not always the earliest sign of glaucoma is emphasized. Field defects are given more diagnostic value than hypertension. Senile and hypermetropic eyes are predisposed to glaucoma because the root of the iris lies near the corneoscleral junction and thus produces a shallow filtration angle.

The histopathology of the glaucomatous eye is described. In chronic compensated glaucoma, the angle of the anterior chamber is always free of anterior synechiae. The atrophic patches which occur in the iris are attributed to obliteration of certain branches of the anterior ciliary arteries. The cupping of the optic nerve is attributed, not to weakness of the fibrous coat at the lamina cribrosa, but to cavernous atrophy of the nerve fibers due to ischemia. When the lamina is deprived of its support through softening of the nerve fibers it recedes.

Edna M. Reynolds.

Redslob, M. E. Attempts at treatment of chronic glaucoma by acidification of the vitreous. *Bull. Soc. Franç. d'Ophth.*, 1938, v. 51, pp. 485-490.

Since the amount of swelling of the vitreous is markedly reduced by lower-

ing of the pH, the author tried introduction of 0.7-percent phosphoric acid into the vitreous as a means of lowering the tension in a series of eyes blind from chronic glaucoma. The results were encouraging. In some cases 2-percent phosphoric acid was used. The eyes stood the process very well. The hypertension was reduced by one or two injections, after which pilocarpine had a markedly increased effect.

Clarence W. Rainey.

Ridley, Frederick. An "active (histamine-like) substance" in the tears. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 2, p. 590.

After reviewing the work and reports on the action of histamine and histamine-like substances in glaucoma, the author concludes from his experimental work that tears normally contain an active histamine-like substance in sufficient quantity to give rise to a wheal and flare on injection into the skin. The aqueous normally contains a substance capable of inhibiting or destroying this substance, and there is evidence that the aqueous of patients suffering from simple glaucoma is deficient in it. Beulah Cushman.

Schmelzer, H. Glaucoma and hepatopathy. *Klin. M. f. Augenh.*, 1939, v. 102, Feb., p. 231.

In systematic examination of the metabolism of 55 patients affected by primary glaucoma, and of 45 controls with normal ocular tension, the author found in glaucoma a noticeable hypercholesterinemia, positive xanthoprotein reaction, and increased bilirubin in the serum. He assumes that a large number of the glaucoma patients suffered from functional disturbances of the liver and that suitable general treatment might exert a favorable influence on the tend-

ency to glaucoma. He proposes a special diet, to "spare the liver," beside local treatment. C. Zimmermann.

Sjögren, Henrik. Allergically conditioned changes in intraocular tension. *Acta Ophth.*, 1938, v. 16, pt. 4, p. 542.

In a 34-year-old woodworker, the handling of certain types of wood induced attacks of unilateral nasal obstruction, edema of the lids, chemosis of the conjunctiva, transitory myopia, hypotension, and obliteration of the anterior chamber. Ray K. Daily.

Sobhy Bey, M. How to keep filtration in recent sclerectomies. *Bull. Ophth. Soc. Egypt*, 1937, v. 30, p. 91.

Frequent atropinization beginning a few days after operation, to provoke increased tension and force the aqueous to pass through the scleral defect, supplemented by milk injections or other foreign-protein therapy to prevent active hypotony of the globe—this is the method advised to insure filtering scars. Edna M. Reynolds.

Suleiman Pasha, S. A. H. The normal intraocular pressure in Egyptians. *Bull. Ophth. Soc. Egypt*, 1937, v. 30, p. 11.

The tension of 675 patients ranging in age from 10 to 50 years is reported, together with measurement of corneal diameters and blood pressure. No direct relation between blood pressure and intraocular pressure was found, nor was there any constant relationship between intraocular pressure and corneal diameter.

In the male patients under twenty years of age, the average tension was 22 mm. Hg (Schiotz); between 20 and 40 years of age, the average tension was 20 mm. Hg; and between 30 and 50 years of age, the average tension was 18.5 mm. Hg. In the female pa-

tients between 20 and 30 years of age the average tension was 20 mm. Hg. The tension for 675 cases varied from 11 to 25 mm. Hg.

Edna M. Reynolds.

Tobgy, A. F. El, and Attiah, M. A. H. The early diagnosis and treatment of glaucoma. *Bull. Ophth. Soc. Egypt*, 1937, v. 30, p. 42.

The importance of study of the variations in intraocular pressure is stressed, and the daily tension curve of the glaucomatous eye is compared with that of the normal eye. A series of provocative tests is outlined for use in cases suspected of glaucoma where the tension curve gives inconclusive evidence. Arecoline hydrobromide is mentioned as a substitute for eserine.

Edna M. Reynolds.

Weinstein, Paul. Etiology of glaucoma. *Brit. Med. Jour.*, 1939, March 4, pp. 436-437.

An investigation undertaken to find a possible relation of glaucoma to blood pressure. The pressure in the ocular vessels was measured by a tonograph, and studies were made on cases of inflammatory, primary, and secondary glaucoma. It was concluded that the circulatory system was intimately in-

volved in the glaucomatous condition, and it was believed that endocrine dysfunction in glaucomatous patients exerted its effect through the circulatory system.

George A. Filmer.

Wilson, R. P. Incidence of glaucoma. *Bull. Ophth. Soc. Egypt*, 1937, v. 30, p. 4.

Figures for incidence of blindness due to glaucoma in a typical Egyptian village are given and compared with similar figures obtained from the Egyptian ophthalmic hospitals. These are found to agree closely. The figures are higher than in other countries, a fact for which the prevalence of trachoma is held responsible.

Edna M. Reynolds.

Wilson, R. P. Primary glaucoma and adrenal-cortex extract. *Giza Mem. Ophth. Lab.*, 1937, 12th ann. rept., pp. 105-108.

Intramuscular injections of cortin in three cases of chronic primary glaucoma failed to have any beneficial effect upon the increasing intraocular pressure. On the contrary, the administration of cortin was actually associated with a slight increase in intraocular pressure.

Lawrence G. Dunlap.

NEWS ITEMS

Edited by DR. H. ROMMEL HILDRETH
640 S. Kingshighway, Saint Louis

News items should reach the Editor by the twelfth of the month

DEATHS

Dr. Lyman R. Forgrave, Saint Joseph, Missouri, died March 9, 1939, aged 64 years. For many years he was active in the American Academy of Ophthalmology and was a member of its Council.

Dr. Robert Sattler, Cincinnati, Ohio, died February 10, 1939, aged 84 years (see Obituary).

MISCELLANEOUS

The American Board of Ophthalmology will conduct a written examination in various cities of the United States, in Honolulu, and Porto Rico, as well as in Canada, on August 5th. Formal application for this examination must be received before July 1st. Oral examination for successful candidates will be held on October 7th, at Chicago. For application blanks and information, please write at once to the Secretary, Dr. John Green, 6830 Waterman Avenue, Saint Louis, Missouri.

The "Amblyopia Reader," written by Dr. Margaret Dobson and published in England, is considered a successful means of stimulating vision in the amblyopic eye. It is also widely used to detect hyperphoria, and in diagnosing defective vision of one eye in cases of refractive errors and congenital blindness. It comes complete with equipment and directions as to technique. Copies of the Reader can be secured from the American Optical Company, Southbridge, Massachusetts.

The course entitled "A Survey of eye conditions" (4 points credit) will be available to students planning to attend New York University summer session. This course offered by New York University since 1932 in coöperation with the Bureau of Services for the Blind, New York State Department of Social Welfare, has become increasingly popular because of the material offered relative to sight conservation and prevention of blindness. It is designed for workers in the fields of education, social welfare, public-health nursing, and allied fields. It is planned to present a background of the conservation of sight together with an appreciation of the medical, social, and educational needs and responsibilities in relation to acute and chronic eye conditions. Lectures will be supplemented by clinic demonstrations.

Please address inquiries regarding registration to Mr. James Meyers, Director of Course, School of Education, New York University, Washington Square, New York City.

The following program is announced for the Seventeenth Annual Summer Graduate Course in Ophthalmology, Denver, Colorado, July 24 to August 5, 1939: Clinical photography of the eye, illustrated, by Dr. Arthur J. Bedell, Albany, New York; Practical office methods. Diagnosis and treatment of corneal diseases, by Dr. Harold Gifford, Omaha, Nebraska; The trachoma problem in the United States. Some aspects of glaucoma, by Dr. Harry S. Gradle, Chicago; Prevention of cataract. Cataract operations, by Dr. Richard W. Perry, Seattle, Washington; Consideration of retrobulbar neuritis. Operative treatment of retinal detachment, by Dr. Lawrence T. Post, Saint Louis, Missouri; Viruses and virus diseases of the eye. Chronic conjunctivitis. Sulfanilamide and other chemotherapeutic agents for ocular diseases, by Dr. Phillips Thygeson, New York City; Physiologic optics, by Dr. William H. Crisp, Denver, Colorado; Cataract operations, by Dr. Edward Jackson, Denver, Colorado.

A course in Visual optics and physiology will be given at Harvard Medical School by Drs. Ludvig, Cogan, and Easton, in July, daily at 9 A.M. to 5 P.M. The attendance is limited to eight. Women are admitted. The fee, \$150.00. With the collaboration of Drs. Verhoeff and Lancaster, this course will be given for those who desire to teach or to do research work in physiological optics. Instruction will include lectures and laboratory work on the following general subjects: reflection, refraction, refractive errors of the eye, accommodation, ophthalmoscopy, retinoscopy, reduced eye, aberrations of the eye, ocular motility, binocular vision, relation between retinal structure and function, visual acuity, light sense, color vision and color blindness, entoptic phenomena, optic-nerve impulses, visual illusions, pupillary reflexes, and intraocular pressure.

The Tenth Annual Summer Graduate Course in Ophthalmology will be held in Rochester, New York, July 24 to 28, 1939. Guest lecturers will be Dr. William Thornwall Davis; Dr. Albert D. Ruedemann, Dr. Sidney L. Olsho, Dr. F. Bruce Fralick, Dr. Martin Cohen, Dr. Clyde A. Clapp, Dr. Donald J. Lyle, Dr. Arthur M. Yudkin, Dr. Ramon Castroviejo, Dr. Harvey E. Thorpe, and nonmedical lectures by the Bausch and Lomb Optical Co. staff; and the guest of honor, Dr. Albert C. Shell. The fee, \$40.00. Further information from Dr. John F. Gipner, Strong Memorial Hospital, Rochester, N.Y.

SOCIETIES

The Third Brazilian Congress of Ophthalmology will be held in Bello Horizonte, July 5 to 12, 1939. The principal subjects are "Surgical treatment of strabismus" by Professor Alvaro, and an address on "Metabolism and the eye."

The Oxford Ophthalmological Congress will convene on July 6-8, 1939, inclusive, Mr. Percival J. Hay being Master of the Congress.

Announcement is made of the formation of the New Haven Ophthalmological Society. The first meeting was held on April 17, 1939. Dr. Eugene M. Blake, 303 Whitney Avenue, New Haven, Connecticut, is president, and Dr. Frederick A. Wies, 255 Bradley Street, New Haven, Connecticut, is secretary.

The dinner meeting of the Cleveland Ophthalmological Club was held February 21, 1939. The guest speaker was Dr. Benjamin Rones of Washington, D.C., who spoke on "Ocular senility."

At the dinner meeting of the Cleveland Ophthalmological Club, held April 4, 1939, all the speakers were local members. Dr. H. H. Shiras spoke on "Use of sulfanilamide in eye diseases." A discussion of this paper was opened by Dr. M. W. Jacoby. Dr. H. V. Phelan spoke on "The fields of vision in multiple sclerosis"; discussion by Dr. Lorand V. Johnson. Dr. A. B. Bruner spoke on "Refinements of technique in cataract surgery"; discussion by Dr. R. E. Thaw.

At this meeting the following officers were elected: Dr. A. D. Ruedemann, president; Dr. Carl McDonald, vice-president; Dr. B. J. Wolpaw, secretary and treasurer.

The International Assembly of the International College of Surgeons met at the Hotel Roosevelt, New York City, May 21 to 25, 1939.

PERSONALS

Dr. Arthur J. Bedell of Albany, New York has returned from London, England, where as an especially invited guest he addressed the Ophthalmological Society of the United Kingdom, on "Fundus changes in diabetes" and demonstrated several hundred of his fundus photographs in color. He was accompanied on the trip by Mrs. Bedell.

Dr. W. E. Bruner, Professor Emeritus of Ophthalmology, Western Reserve University, School of Medicine, recently returned from a six weeks holiday to the West Coast.

Dr. Paul Motto, Clinical Professor of Ophthalmology, Western Reserve University, School of Medicine, spoke recently before the Section on Ophthalmology of the Ohio State Medical Society, at Toledo. His subject was "The management of hyperphoria."

Dr. Charles Thomas, until recently Resident Ophthalmologist of the University Hospitals of Cleveland, announces the opening of his office in the Carnegie Medical Building, Cleveland, Ohio.

A recent visitor to the Cleveland Eye Clinics was Dr. Ernest Krug, Associate Professor of Ophthalmology, Columbia University. Dr. Krug was a former resident of Cleveland.

Dr. Walten Holt McKenzie announces the opening of his office at Suite 1607 Medical Arts Building, Fort Worth, Texas.

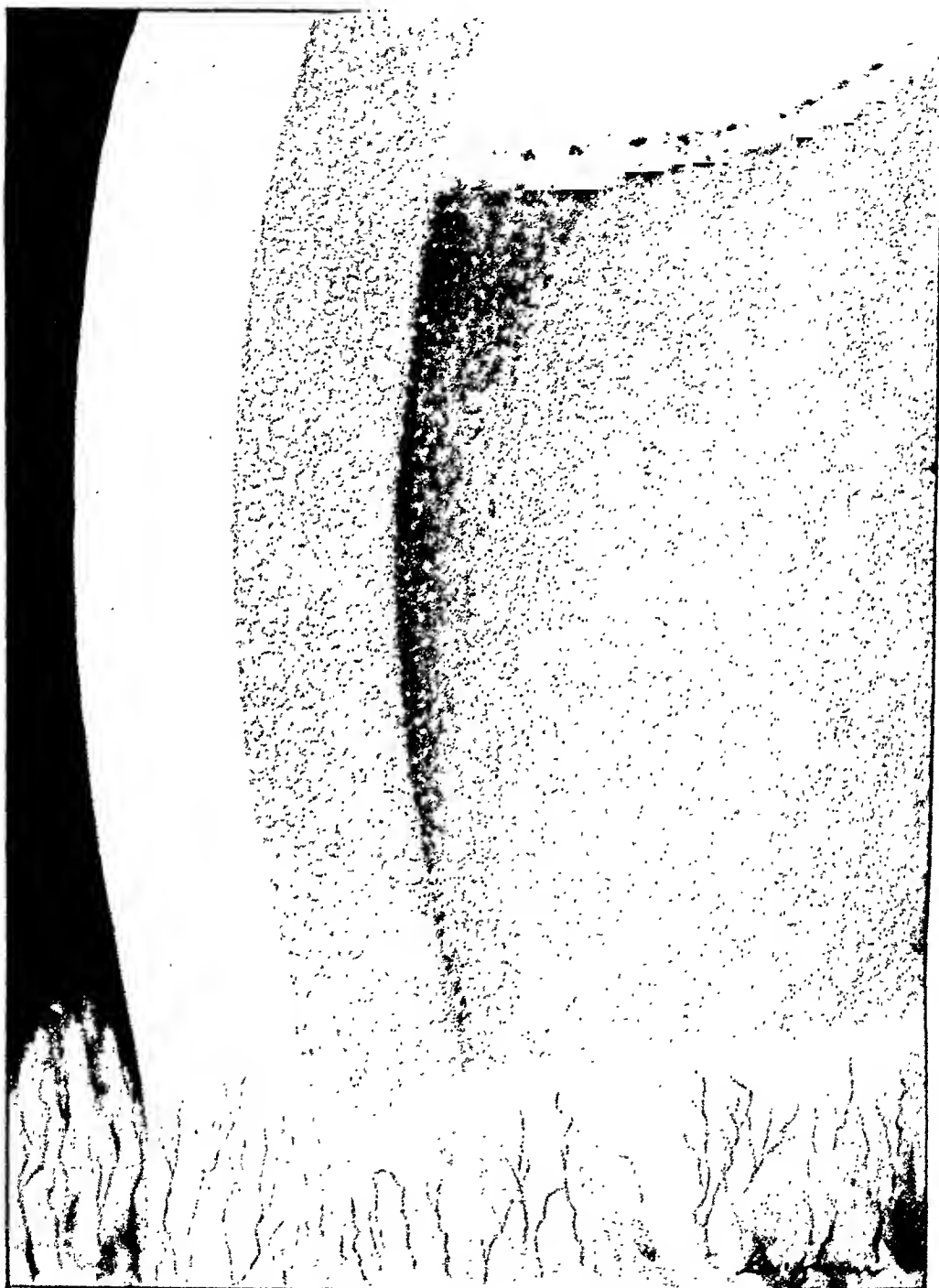


FIG. 11 (MEYER AND OKNER). SLITLAMP VIEW OF CORNEAL CHANGES IN DYSOSTOSIS MULTIPLEX.

DYSOSTOSIS MULTIPLEX WITH SPECIAL REFERENCE TO
OCULAR FINDINGS

SAMUEL J. MEYER, M.D., F.A.C.S., AND HENRY B. OKNER, M.D.

Chicago

Dysostosis multiplex is a rarely seen, sharply differentiated syndrome, classified under the group known as "osteodysplasias."

The first two cases were observed in 1919 by C. Hurler at the Munich Pediatric Clinic. Several cases were briefly described later on, mostly by American authors, usually under entirely varying symptoms. The original form of dysostosis multiplex of the "Hurler type" is rarely observed and evidently more seldom diagnosed. About 20 cases have been reported in the literature up to the present time. To this number we shall add another case observed on the service of the senior author, at the Illinois Eye and Ear Infirmary. The patient has been under the care of Dr. Sauer of Evanston, Illinois, as a pediatric problem since early infancy. The unusual findings merit elaboration both from the ophthalmological and pediatric standpoints.

CASE REPORT

G. R., a female, born January 22, 1931, is now seven years old. The parents are healthy and unrelated. The mother is of average height and the father is moderately tall. The parents were about 35 years old at the time of the child's birth. There was no similar condition known in the antecedents, but a son of the father's cousin is obese and is said to have hypopituitarism. The mother's second pregnancy had been a miscarriage at 3 months.

A brother, aged nine years, is normal and weighed 5 pounds 3½ ounces at birth. The mother's teeth are slightly irregular and the lower jaw slightly prominent. The father's nose is slightly concave. Otherwise, the parents are apparently normal and showed no other hereditary similarities in common with the child's appearance.

The child weighed 6 pounds and 3 ounces at birth, was delivered by low forceps, and appeared normal. She has been under competent pediatric care since birth, and was breast fed until 3 months old. She has always received sufficient vitamin and food intake. The mother stated that she first noted some peculiarity in the child at 1½ years of age; namely, the abdomen impressed her as being large. However, childhood photographs taken at numerous periods from the time of birth show the earliest tendency to abnormality to be perhaps at the age of one year. Shortly after the large abdomen was noted, flexion and stiffness of the left fourth finger was noticed, and within a year this condition had spread to all the fingers of the hand. Curvature of the spine was also noted at about this time. A brace was applied to the spine when she had reached the age of 2½ years. After 1½ years, it was replaced by a corset that was kept on for 6 months. Improvement of the spine seemed to have resulted.

On May 1, 1934, when she was 3 years

old, the child had bilateral mumps, and shortly afterwards "shaking" of the eyes was noted. Gradually it was noticed that the child could not make out objects very well at a distance. In June, 1937, tonsillectomy and adenoidectomy were performed, and in the mother's opinion the child's vision for distant objects has been improving since then.

The patient had bronchopneumonia in August, 1934, and chicken pox in June, 1935.

She sat up at 6 months; stood up at 1 year; walked at 15 months; had her first tooth at ten months; was able to say simple words at 16 months and short sentences at 2 years.

General Examination

One is immediately impressed by the unusual appearance of the child. There is a suggestion of cretinism and achondroplasia (fig. 1). She weighs 16.6 kilos and is 97 cm. high. There is a tendency to duck-waddle, and genu valgum is present. The feet drag slightly. At one time the child walked almost entirely on her toes. The arms are slightly bent and kept somewhat stiffly to the side. Shoulders and back incline backwards as though balancing the protuberant abdomen.

The skin is soft and light complexioned and reveals no abnormalities. It seems to have a peculiar sweetish musty odor. There is heavy blond hair on the back, extensor surfaces of the arms and forearms, and on the anterior surfaces of the legs. The head is large; the circumference from frontal bosses to occiput is 53.2 cm.; frontal-occipital diameter 19 cm.; bitemporal 14 cm.; and biparietal 14.2 cm. The fontanelles are closed. The light-brown hair is heavy, long, and soft in texture. The forehead is prominent, and the nose is markedly saddle-shaped with large nares. The cheeks are full, rounded, and sagging, the lips thick, and the mouth

is moderately large. The tongue is thick and fleshy, but dentition is poor (fig. 2). The maximum number at any time has been only 16 teeth, since the posterior molars have never erupted. Roentgenograms show that permanent teeth are present. The teeth have been filled and five central teeth have fallen out, one above and four below. The enamel of the teeth is soft and thin. The roof of the mouth is moderately arched and long, so that the pharynx is difficult to inspect. The ears are negative as to pathology, with normal drums. The skull presents a moderately prominent temporal ridge above the ears. The eyebrows are bushy with long eyelashes and thick, heavy eyelids. The neck is so short that the head seems to rest on the shoulders, while the thyroid is difficult to palpate.

The anterior and posterior parts of the chest are prominent as indicated in figure 3. The circumference is 58.3 cm., and there is no rachitic rosary. A soft systolic murmur is heard at the apex. The lungs are normal. There is a marked pot belly and umbilical hernia, with a circumference measuring 63 cm. (fig. 4). The liver is palpable two fingers below the right costal arch, and the spleen is palpable two fingers below the left costal arch. Both organs have apparently been more prominent on earlier examination due to the spinal deformity. The labia are well developed and somewhat redundant. There is a scoliosis to the left and a slight kyphosis of the spine at the level of the iliac crests as shown in figure 5. A moderate lordosis is present in the lumbar region.

The shoulders measure 23.7 cm. between the acromial tips. The shoulder joints are fairly movable; the arms can be brought up almost to the vertical. The bones of the arms appear to be stiff and more involved than the lower extremities. Supination of the forearms is only par-

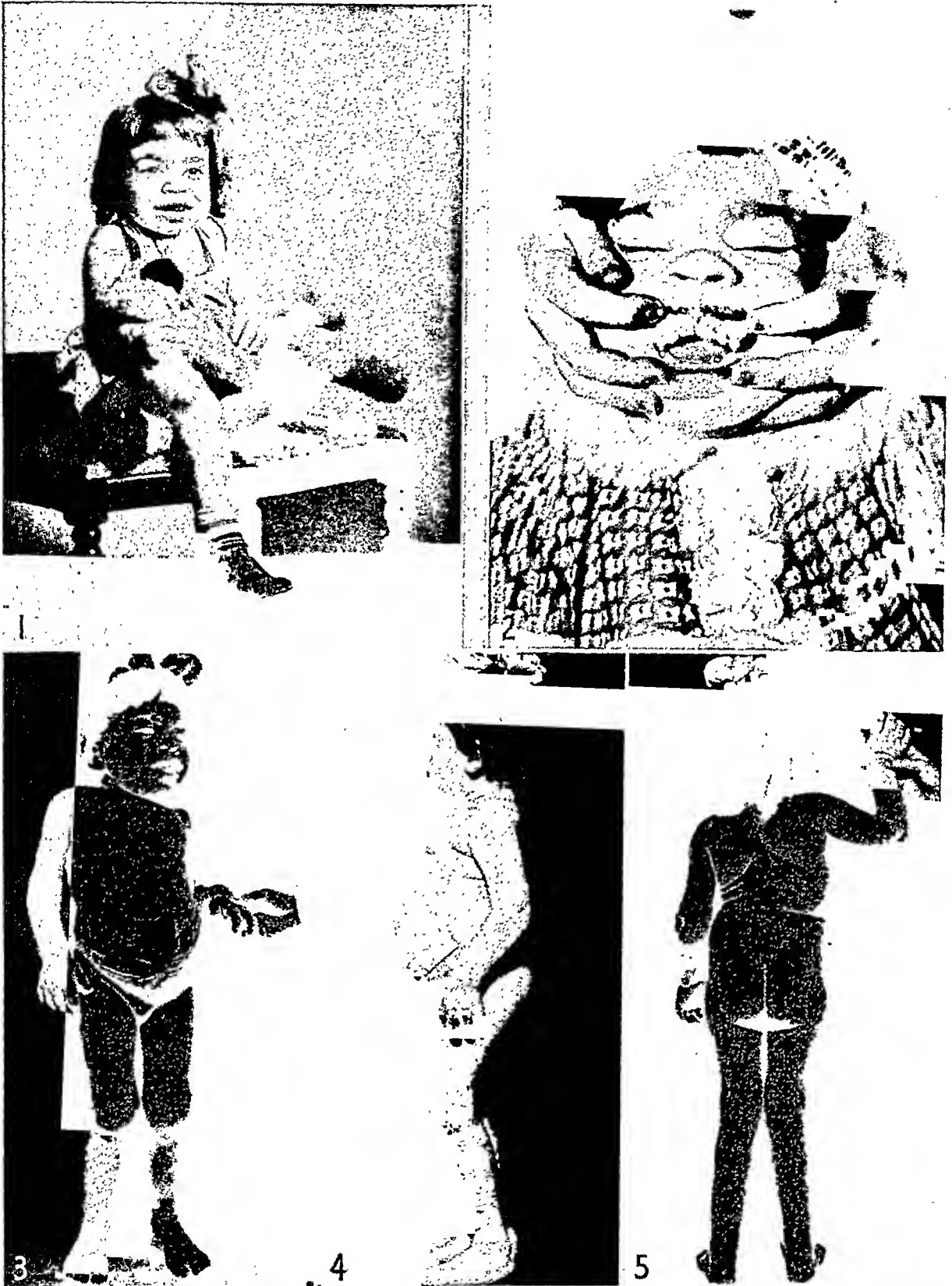


Fig. 1 (Meyer and Okner). G. R., general appearance at age of 7 years. Fig. 2 (Meyer and Okner). Dentition poor. Teeth set apart with tendency to taper. Fig. 3 (Meyer and Okner). Prominence of anterior part of chest. Fig. 4 (Meyer and Okner). Marked pot belly and umbilical hernia. Circumference 63 cm. Fig. 5 (Meyer and Okner). Scoliosis of the spine to the left, and slight kyphosis at the level of the iliac crests.

tially possible. The humerus measures 15.9 cm. from the acromion to the lateral condyle; the ulna measures 12.7 cm.; the wrists are 14 cm. in circumference, with fair mobility. The finger joints are stiff with only partial mobility. The middle finger measures 7.37 cm.

The thighs flex fairly well on the abdomen but the legs flex on the thighs to 45 degrees with difficulty. The femur measures 23 cm. from the greater trochanter to the lateral condyle. The knees are rounded and large with a circumference of 25 cm.; immediately above and below them, the circumference of the leg is 21.6 cm. The bones of the thighs and legs, except for the large knees and genu valgum, appear to be normal. The ankles move freely. The insteps are high, and there is marked pes cavus. The toes are practically normal, but the distal phalanges cannot be hyperextended.

The child's mentality and memory are very good. She is affable, pleasant, and cooperative. An intelligence test by a psychologist was as follows: mental age, 7 years and 2 months; chronological age, 6 years and 3 months; intelligence quotient, 114; basic year, 6; passed 3 tests in the 7th year, 3 in the 8th year, and 1 in the 9th year. Her reaction time is slow; and there is a visual-auditory defect. In a more recent test, an I.Q. of 84 was obtained. She has had practically no schooling until recently, but is able to write simple things.

Her hearing seems to be impaired. She often says "huh" when first spoken to, but since she sometimes seems to hear things which one would not think audible to her, this may be only a habit. A hearing test shows the following: whispered voice, R-6', L-6'; Rinne R-, L-; Weber R-?, L-?; bone R-18, L-18; air R-7, L-7; Schwabach 8. Diagnosis: otosclerosis (?).

Medication: At 2½ years of age and

until recently, the child received mixed gland extract (Female No. 2—Burroughs-Wellcome), two tablets daily, and one yeast tablet daily. She has had cod-liver oil and orange juice in adequate quantities since the age of one month.

Laboratory Findings

Serology: Kahn test—negative; Mantoux—negative.

<i>Blood chemistry:</i>		<i>Normal</i>
Calcium	10.5 mg./100 c.c.	9-11
Phosphorus	3.7 mg./100 c.c.	3.7-5.0
Serum albumin	4.7 percent	4.6-6.7
Serum globulin	2.1 percent	1.2-2.3
Bilirubin	Normal	0.1-.25
Nonprotein-nitrogen	27. mg./100 c.c.	25-35
Creatinine	Normal	1-2
Cholesterol	322. mg./100 c.c.	150-190
Fatty acid	670. mg./100 c.c.	
Lecithin	1.3 mg./100 c.c.	

Blood count:

Hemoglobin 70 percent
 Red blood cells 4,540,000
 White blood cells 5,200
 Lymphocytes 52 percent
 Mononucleocytes 1 percent
 Neutrophils 45 percent
 Eosinophiles 2 percent

Basal metabolic rate: Unsatisfactory test.

Urine: Clear and essentially negative.

Glucose tolerance test:

Fasting 78 mg./100 c.c. blood
 9:30 115 mg./100 c.c. blood
 10:30 140 mg./100 c.c. blood
 11:30 128 mg./100 c.c. blood

Electrocardiographic report:

Tachycardia
 R V P
 T 1-2 prominent
 T 3 low, diphasic
 Q 4 small
 ST 4 depressed

P 2 prominent

Compatible with congenital heart disease

Roentgenograms

The positive roentgenographic findings when examined on November 24, 1937, at the Illinois Eye and Ear Infirmary by

flaring and blunting at the distal extremities with the spinal attachment and portion of the rib just distal to the articulation markedly narrowed with thinning of the cortex (figs. 8 and 9). The clavicles are thin at their distal extremities and quite clubbed at the sternal ends. The scapulae are small and irregularly

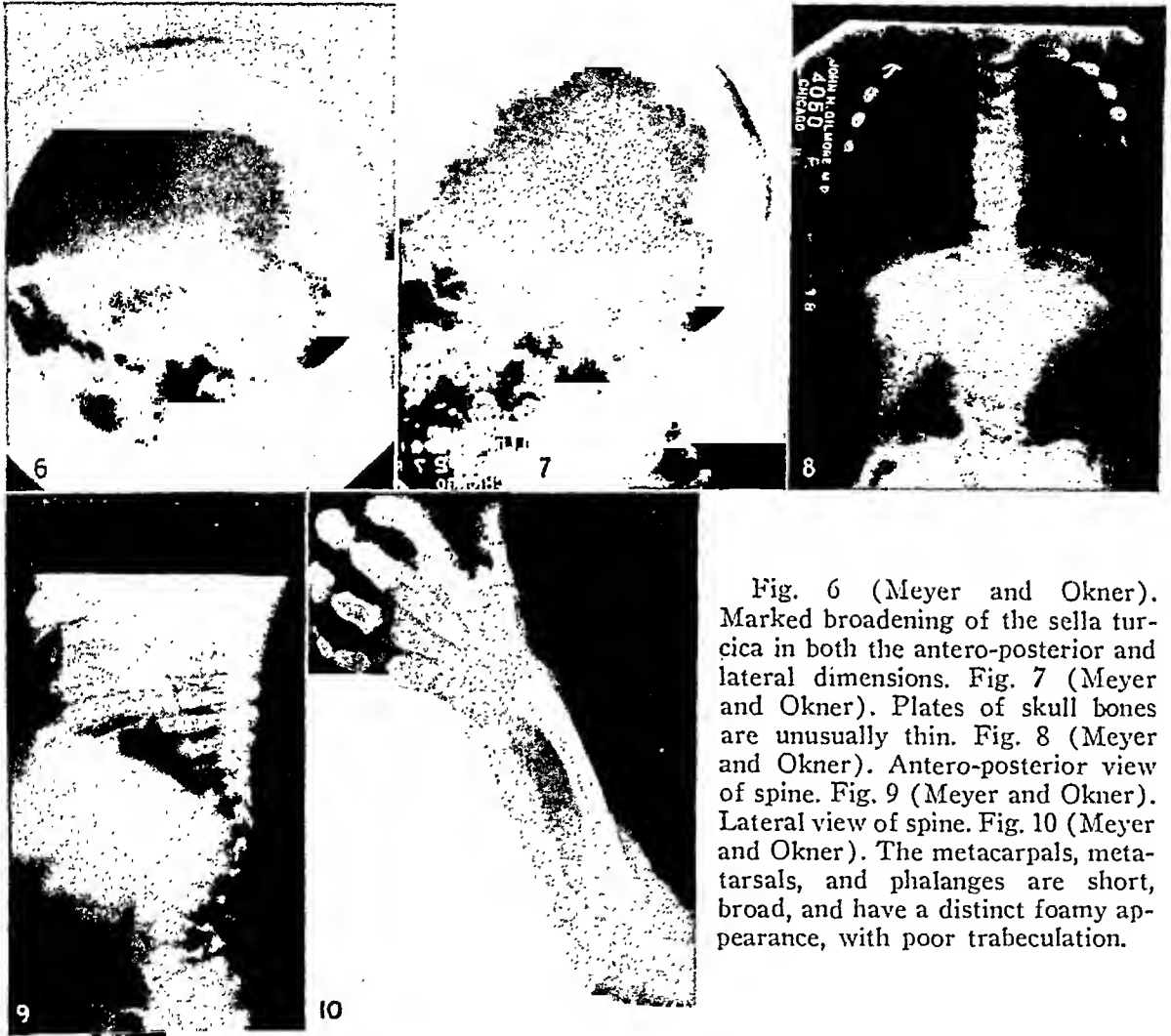


Fig. 6 (Meyer and Okner). Marked broadening of the sella turcica in both the antero-posterior and lateral dimensions. Fig. 7 (Meyer and Okner). Plates of skull bones are unusually thin. Fig. 8 (Meyer and Okner). Antero-posterior view of spine. Fig. 9 (Meyer and Okner). Lateral view of spine. Fig. 10 (Meyer and Okner). The metacarpals, metatarsals, and phalanges are short, broad, and have a distinct foamy appearance, with poor trabeculation.

Dr. John H. Gilmore were as follows:

Skull: Marked broadening of the sella turcica in both the antero-posterior and lateral dimensions, with thickening of the posterior clinoid processes, a finding consistent with an intrasellar tumor (fig. 6). The plates of the skull bones are unusually thin, particularly through the vertex. (fig. 7).

Chest: The lung fields are negative. The ribs show a marked tendency toward

formed. There is evidence of growth disturbance at the upper end of the humeri.

Extremities: All extremities and articular components present evidence of growth disturbance with roughening and irregularity, shortening of the bones of the forearms, and poor development of the carpal and tarsal bones. The metacarpals, metatarsals, and phalanges are short and broad and have a distinct foamy appearance with poor trabeculation (fig.

10). The terminal phalanges are very small and pointed.

Pelvis: The hips present a decided tendency toward coxa-valga deformity. The rami of the ischium and pubis on each side are very thin at their opposing areas.

The findings described throughout the skeletal structure are consistent with and fall in the roentgenographic classification of a form of dyschondroplasia.

Ocular Examination

Both eyes: The lids and surrounding skin are normal. The eyes are parallel. The palpebral and bulbar conjunctivae are pale and normal; no scars are present. The corneae upon superficial inspection reveal a rather marked cloudiness or opacification, which is present over the entire corneal area. There are no scars visible in the cornea. The corneal cloudiness is so marked that details of the deeper structures, such as the iris, pupil, and lens, cannot be clearly seen. With difficulty it can be seen that the pupil is only 2 to 3 mm. wide. No detailed structures of the iris can be made out. The corneae are much larger than normal, measuring approximately 14 mm. in diameter. The megalocornea gives the picture of a congenital hydrophthalmos. However, the tension when measured with a Schiötz-Gradle tonometer under ether anesthesia was found to be 25 mm. Hg in each eye. This measurement was repeated at a later date for verification, when it was found to be 24 mm. in each eye, approximately the upper normal limit. This is, therefore, a true megalocornea or megalophthalmos, and not a congenital glaucoma or hydrophthalmos.

Slitlamp examination of the corneae (frontispiece) revealed the following: The superficial corneal layer is flat and regular; there is evidently no change in the epithelium. In the corneal stroma, dif-

fusely scattered in all the layers, and also in Bowman's membrane, can be seen many small, definitely punctate opacities of a grayish-white appearance. They are quite numerous and thick; in many areas are more marked opacifications, probably due to conglomerations of the small punctate opacities. Such areas are also arranged in small threads and plexiform regions. No definite correlation between these clumps of opacification and the corneal-nerve distribution is observable. There seems to be no change in the endothelium.

The corneal sensitivity appears to be normal. The corneal opacification is so dense that the iris, pupil, and lens details cannot be seen clearly at all. No fundus details can be made out. The vision in the right eye is the ability to count fingers at 6 feet, and light perception in the left eye. We were not able to obtain visual-field measurements due to lack of coöperation.

It was at first believed that we were dealing with a hydrophthalmos, due to the large diameter of the corneae, their cloudiness, and the poor vision present. However, the tension upon several measurements was never found to be over 25 mm. Hg in each eye. We therefore believe that the megalocornea and cloudy cornea are a part of the characteristic picture in the syndrome of dysostosis multiplex. However, in previously reported cases no mention has ever been made of any enlargement of the corneal diameter such as was noted in this case, and, from the ophthalmological point of view, this was the most conspicuous finding in conjunction with the corneal opacifications.

Discussion

Dysostosis multiplex reveals a uniformity in its entirety, yet the individual findings give varying impressions. Ullrich believes the family likeness of these children is as marked as that found in Mon-

golian idiots and other typical combination syndromes of multiple degenerations.

These children, usually the offspring of healthy families, at the time of birth already have a generally enlarged or deformed skull (most frequently a boat-shaped skull, more rarely an acro- or brachycephalic shape of head). After an initial normal growth, there develops a disproportionate dwarfishness or a lack of normal development. The corneal opacification of cloudiness has been present in all the cases reported to date. As pathognomonic for dysostosis multiplex may be mentioned: the massive facial portion of the skull with the broad sunken root of the nose, the large alveolar processes, the thick fleshy tongue, the deformity of the thorax, the acute angle of the lumbar portion of the spine with its limited gibbous formation, the disfigurement of the short, plump limbs, the decrease in movements of the joints, and the clawlike form of the hands, with the contracture in the flexion position of the phalanges. As a rule, there is also present: a large prominent abdomen with deeply developed navel and hernia formation, muscular flaccidity, hypertrichiasis, and liver and spleen enlargement. Occasionally marked mental retardation is also present, but in our case the mentality was about normal.

DIFFERENTIAL DIAGNOSIS

The demarcation of dysostosis multiplex from the various forms of the degenerative dysostoses is somewhat complicated. The Hurler syndrome presents an isolated picture of congenital origin, many symptoms and findings of which can be recognized during the first year of life, becoming more manifest as the child develops.

In the Morquio syndrome, first presented in 1929, there is a dwarfism due to a generalized disease of the bones. The

children are born normal, but at the time they learn to walk, there develop symmetrical deforming changes in the skeletal system, except in the skull and face. No pain is present, but marked functional changes occur. Grotesque changes are found in the thorax, and twisting of the vertebral column occurs. The extremities, at first of normal length, become shortened due to the marked deformities that occur. Outwardly there is a slight resemblance to achondroplastic dwarfism. Sexual and intellectual development are normal. Roentgenologically, there may be found in both diseases marked changes in the vertebral and joint regions. In contradistinction to dysostosis multiplex, Morquio's syndrome has a definitely familial occurrence. No abnormal skull configuration nor corneal opacification is found in the latter.

With the disproportionate dwarfism that is such a characteristic picture in dysostosis multiplex, one must not only consider the disturbance of growth in combination with other malformations, but also the previous history of the child, in order to differentiate the various other forms of dwarfism.

Chondrostrophia—the most familiar form of disproportionate dwarfism—reveals at the time of birth such a characteristic picture, in spite of the variety of individual findings, that there should be no difficulty in differentiating it from dysostosis multiplex.

Rickets may also result in a decreased stature. On account of the body weight, the lower limbs are more deformed than the upper in the osteomalacia form of rickets. There were neither clinical nor roentgenological changes in our case that might even resemble the changes found in severe rickets. The shape of the head is not the typical square-head with the sharp protruding frontal and parietal eminences. The presence of a kyphosis

shortly after birth also points against rickets. The curvature of the spine that is found in rickets is first noticed only after the child begins to sit up and the weight of the body has to be borne. The rachitic kyphosis develops as a hump in the middle part of the vertebral column in contrast to the angular flexion usually found in the upper region of the lumbar portion of the spine in dysostosis multiplex. In contradistinction to the delayed ossification of the epiphyseal lines and hyperflexibility in rickets, one observes an early sclerosis of the epiphyseal lines and a decreased limb function in Hurler's disease. The various accompanying malformations present in dysostosis multiplex, especially the corneal cloudiness, never occur in rickets.

There is nothing similar clinically, with reference to diseases resulting in bodily maldevelopments, such as may be caused by disorders of the glands of internal secretion. When one compares the syndrome found in a thyroid dysfunction with that seen in dysostosis multiplex, the differentiation, at least on paper, is not always simple. Characteristics which one familiarly sees in hypothyroidism are also met with in Hurler's disease; namely, diminution of the entire bodily development, heavy bone structure, clawlike hands, sunken root of nose, broad facies, tendency to hernia formation, and deficient intellectual and psychic development. Although the skeletal system may be deficient in development in hypothyroidism, yet there are no deformities. While thyroid dysfunctions are usually accompanied by late, irregular development of centers of ossification and late closure of epiphyseal lines, the centers of ossification in dysostosis multiplex, even though irregularly formed, usually become ossified at the normal time, and the epiphyseal lines become sclerosed ahead of time.

Roentgenologically and clinically there is no basis for cretinism, with its peculiar bodily and psychic degeneration, and its accompanying goiter formation, mental deficiency, and dwarfism.

Arrested development, caused by disturbances of the hypophysis, can also be ruled out diagnostically. This form of dwarfism reveals graceful bone formation, without deformities, with open epiphyseal lines. Hypophyseal dwarfism is usually accompanied by an underdevelopment of the genitalia and the secondary sex characteristics.

Hanhart's dwarfism should not be confused with the arrested development seen in such a case as is here described. Hanhart's disease is usually of a familial type, while Hurler's disease is usually a single or isolated occurrence. The growth or developmental deficiency begins in the first three years of life, the development previously being normal. It belongs to the type of dystrophia adiposogenitalis. There are no deformities of the skeletal system.

Primordial dwarfism cannot be a cause of this severe disturbance of development. Primordial dwarfs are born as dwarfs, grow gradually, begin to develop at the normal time, and reveal a normal advancement of the centers of ossification and sexual development.

Differentiation of this case from the arrested growth of infantilism is not difficult, as deformity of the skeletal system does not belong to the clinical picture of the latter. The infantile affliction is accompanied by retarded epiphyseal closure, gradual formation of centers of ossification, and infantile proportions. The formation of the sexual organs is retarded. The mentality remains infantile and fails to develop properly.

The differential diagnosis must also include the following large group of degenerative hyper- and hypoplastic dysostoses; namely,

1. *Dystrophia periostalis hyperplastica familiaris* (Dzierzynski).

2. *Dystrophia craniofacialis hereditaria* (Crouzon).

3. *Dysostosis cleidocranialis hereditaria* (Scheuthauer, Marie, and Sainton).

The degenerative basis of these three dysostoses reveals an outspoken familial character. In neither the group of dwarfism nor in that of the degenerative dysostoses alluded to in the differential diagnosis so far, is such characteristic corneal cloudiness found as in Hurler's disease.

The ocular findings that help to differentiate this disease are quite characteristic. They have been mentioned in the literature by Ellis, Sheldon and Capon. However, no case of megalocornea has ever been mentioned previously, and in this respect the present case differs materially from all those heretofore reported. The characteristic changes mainly noted have been punctate and flaky opacities of the corneal parenchyma in an otherwise normal cornea. The fact that there is no evidence of inflammation present, and that the process has remained stationary over a long period of observation, places the symptom-complex in the category of the degenerative corneal diseases.

The question arises as to the classification of this case among the known types of corneal degeneration. Obviously it does not belong in the group of band-shaped keratitis of primary or secondary origin, as this usually occurs in later life and is often unilateral. As the epithelial and endothelial membranes are intact in this case, it can be readily differentiated from epithelial and endothelial dystrophy of the cornea, under the former of which one must include the familial forms of Axenfeld; namely, fatty degeneration, *dystrophia calcarea*, *dystrophia urica*, and *dystrophia myxedematodes*. These changes occur during later life and are

characterized by finding the aforementioned substances in the corneal substrata. In fatty degeneration there are found thick, yellow opacities, located usually centrally, only occasionally peripherally, and, as seen with the slitlamp, they appear as clumps, lines, or points, lying close together in conglomerations, while other parts of the cornea are entirely clear. New blood-vessel formation is also present.

Axenfeld's *dystrophia calcarea* reveals white nodular or linear formed opacities located usually in the periphery. *Dystrophia urica* as described by Uhthoff is very rare. Here one finds deep, yellowish-gray, gold-glistening punctate opacities, arising at the limbus and spreading towards the center of the cornea. The myxedematous dystrophy of Axenfeld is characterized by white areas that arise in the corneal periphery and spread centrally. They later encroach upon the center and become vascularized.

It can, therefore, be clearly seen that the corneal changes present in this case cannot be placed in any definite classification of the corneal degenerative changes previously mentioned.

We also have to consider the familial forms of corneal changes that occur without vascularization, but have a familial tendency. According to Bücklers, there are three forms: the brittle form, usually located centrally; the speckled or spotted form, in which the entire corneal surface is affected and the epithelium raised in isolated areas; and the latticelike degeneration of Haab-Dimmer. The corneal sensitivity in all these cases is usually altered, but was found unchanged in this case. No hereditary factor has ever been mentioned in any of the cases of Hurler's disease reported to date.

There are also other isolated cases of corneal degeneration that cannot be placed in any single group or classifica-

tion. Included are many cases in which many fine punctate opacities occur in the corneal parenchyma, without any visual disturbance. These are cases of the types reported by Meesmann, Cacchione, Riegel, and de Schweinitz and Cowan. Meesmann's case had no hereditary factor, but differs from our case in that it occurred in adult life and Bence-Jones protein was found in the urine. The cases of Riegel, Cacchione, and of de Schweinitz and Cowan were of a hereditary nature, and were present in several members of a family. Cacchione's patient was an amaurotic idiot.

It can readily be seen that this case cannot be classified with any of the known groups. It must be considered as a specific form of corneal degeneration, it is intimately associated with the clinical picture of dysostosis multiplex, and is evidently a characteristic part of this disease.

Should we desire to include these changes in a separate category under corneal degeneration, it must be considered with the clinical picture and the other symptoms of which it is an integral part. In view of the fact that we have no anatomical nor chemical data involving the substrata, it may be possible that further research may link it up with other

processes. In a similar case Hurler has already demonstrated anatomical changes of lipoid degeneration in the brain and optic nerve which reveal a similarity to amaurotic idiocy and Niemann-Pick disease.

The question as to the cause of these corneal changes can be answered only by maintaining that it is an integral part of the entire clinical picture and can be discussed only with the other symptoms.

The dwarfism as such, the infundibular thorax, the angulation of the vertebral column, the deformities of the joints accompanied by the veil-like corneal opacifications are seen as restricted endogenous constitutional malformations, as to the causative factors of which nothing definite can be stated.

The condition does not seem to be a hormone disturbance but rather some disruption in the normal cellular process of the body, the exact precipitating cause of which is unknown.

Because of the large sella turcica a pituitary disturbance was at first considered possible. The patient was seen by Dr. Eric Oldberg because of the thought of possible benefit from a transphenoidal operation on the pituitary, but this was not deemed indicated.

58 East Washington Street.

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LECTURES ON MOTOR ANOMALIES*

XI. ETIOLOGY, PROGNOSIS, AND TREATMENT OF OCULAR PARALYSES

A. BIELSCHOWSKY, M.D.

Hanover, New Hampshire

The etiology of ocular paralysis as the basis for treatment cannot be discussed in detail here, but I should like to refer to some results of my own researches in so far as these results differ from the views recorded in textbooks. An interesting point worth mentioning is the indubitable increase in the percentage of cases of paralysis of the trochlear nerve, which I was able to ascertain by comparison of the material that I collected during the last 30 years with that of the preceding years. This increase cannot be attributed in any way to an improvement in the methods of investigation, since all the cases included in these statistics have been examined solely by myself. Up to the year 1908 the number of cases of trochlear-nerve paralysis amounted to 10 percent of all cases of paralysis, not quite half as many as the cases of paralysis of the abducens nerve. From that time until 1932 the percentage of cases of trochlear-nerve paralysis was about 20, and that of abducens-nerve paralysis the same as before, about 25 percent. I am sure that the striking increase in the number of cases of trochlear-nerve paralysis is due to the introduction of Killian's operation and of similar radical operations on the frontal sinus. These operations came into vogue between 1903 and 1908. In these operations the trochlea recedes into the orbit after the periosteum is cut through. If the operation is finished without the refixing of the trochlea to its original attachment by exact periosteal sutures,

the function of the superior oblique muscle is weakened. In the majority of cases this weakness lessens gradually and disappears within a few weeks, but in some cases it becomes permanent and displays the typical manifestations of paresis of the trochlear nerve.

In the 80 cases of trochlear-nerve paralysis that I have seen in my clinic during the years 1923-1932, no less than 15 had been caused by operations on the frontal sinus.

A traumatic origin was found in 15 percent of all my cases of paralysis.

Syphilis and metasyphilis constitute the most frequent cause, and in statistics published years ago the percentage of cases due to these conditions was from 50 to 60. In 1906 I found that 55 percent of my cases belonged to this group, nearly the same as the percentage found by Sauvinau. This has decreased considerably since then. Less than 30 percent of the cases of paralysis collected during the years 1923-1932 were of syphilitic or metasyphilitic origin. In all cases the blood and spinal fluid were examined. The indubitable decrease in the occurrence of ocular paralysis due to syphilis and metasyphilis should be attributed, in all probability, to the modern therapy of syphilis.

Next in frequency are the cases of paralysis of congenital origin and paralysis caused by epidemic encephalitis (14 percent each). I cannot enter into the particulars of the interesting and extremely multifarious disturbances of the oculomotor apparatus that are encountered in cases of epidemic encephalitis and of postencephalitic paralyses and

*From the Dartmouth Eye Institute, Dartmouth Medical School. Read before the Seventh Annual Mid-Winter Clinical Course of the Research Study Club, Los Angeles, California, January, 1938.

spasms. I must also omit discussion of certain well-known etiologic factors, such as, intracranial diseases, anomalies of the blood vessels, and acute infectious diseases. Among the paralyses of toxic origin, those due to spinal anesthetics, especially benzoyldimethylamino-ethyl-prop-panol, procaine hydrochloride, or tropa-cocaine, have been numerous and known for a long time; they have been mostly paralyses of the sixth nerve, less frequently of the trochlear nerve, and only exceptionally of the third nerve. As a rule, the paralysis arises a few days after the injection and takes some weeks to disappear. Opinions differ as to whether the nuclei or the nerves are damaged and how they are damaged by the poison. In the course of time the frequency of these paralyses has gradually decreased. During the years 1923-1932, out of 600 cases of ocular paralysis in my clinic, not a single case had been caused by a spinal anesthetic.

Because of its extreme rareness I shall mention two cases of paralysis of the abducens nerve due to severe loss of blood.

One patient had been wounded by a file and had lost an enormous quantity of blood. When he was discharged from the hospital he was extremely anemic and complained of blurred vision and of seeing sparks before his eyes. I found a slight paralysis of the right abducens nerve to be the only cause of his ocular troubles. It diminished slowly and disappeared within a year.

From the second patient a considerable quantity of blood had been taken for the purpose of transfusion. The following day she noticed diplopia and, according to her physician's report, there was paralysis of both sixth nerves. When I saw her some months later she displayed a convergence angle of 20 degrees, that increased neither when looking to the

right nor left. Improvement was slow; after 13 months she was finally cured.

Lastly, it should be noted that in spite of the most careful investigation the etiology of ocular paralysis still remains obscure in a comparatively high percentage of cases, in my material in 15 percent.

PROGNOSIS OF OCULAR PARALYSES

A few comments may be permitted with respect to the prognosis in cases of ocular paralysis. Spontaneous recovery occurred in 38 percent of my cases, the percentage, however, being entirely different for the various forms of paralysis. The highest percentage of recovery (about 57 percent) was found in cases of paralysis of the trochlear nerve, nearly 50 percent in paralysis of the abducens nerve, but only 28 percent in paralysis of the third nerve, in ophthalmoplegia, and in associated paralyses. The reason for these differences is easy to understand. The majority of cases of paralysis of the fourth and sixth nerve are caused either by a trauma or by a tiny nuclear hemorrhage that may be reabsorbed within a short time, whereas in the majority of the other paralyses the lesion is more serious and of greater extent; more than 50 percent are due to syphilis or metas-yphilis—factors most unfavorable relative to prognosis. Among the cases of spontaneous recovery from the paralysis, the cases with an obscure etiology constitute the highest percentage. In the majority of these, the paralysis may be of toxic or infectious origin or may be caused by tiny nuclear hemorrhages. Sometimes such paralyses disappear within a few days or even hours, as suddenly as they appeared.

As to how soon operations for the correction of paralytic deviations are advisable, it is important to know that if six months have elapsed since the inception of the paralysis the possibility for

spontaneous recovery is extremely meager. I remember patients with traumatic paralysis who, for six months, presented a constant condition, especially a constant restriction of mobility and a constant angle of squint, after which time they began to improve and continued to complete recovery. Therefore, I never operate for a paralytic deviation until at least six months have elapsed.

TREATMENT OF OCULAR PARALYSES

As to the treatment of ocular paralysis, the causal indication must be considered primarily. The often surprising results of antisyphilitic therapy in cases of paralysis caused by cerebral syphilis are well known, but even in cases in which the nature of the paralysis cannot be revealed a cure is frequently effected by means of diaphoretics, mercury, iodine, and other medicaments. Patients suffering from cerebral hemorrhages due to disturbances of the circulatory apparatus must take laxatives, have their diet regulated, and remain in bed for several weeks.

The local treatment during the first stage is only palliative. Occlusion of the paralyzed eye to remove intolerable diplopia is often unavoidable, but it must be limited to the shortest possible time because the exclusion of the fusion tendency prevents a compensatory innervation and aids the development of secondary contracture.

As long as the angle of squint does not remain constant in the different directions of gaze, prism spectacles do not help at all, not to mention the fact that, as a rule, prisms stronger than 4 or 5 degrees cannot be endured and, moreover, prisms cannot correct a meridional deviation of the eyes; that is, disclination or conclination. In my opinion, galvanic treatment, though much used, is helpful only as a suggestive measure, for, due to the dan-

ger of injuring the retina, the current must be so weak that it does not produce a contraction even of the normal muscles of the eye.

If no success or only partial improvement has been obtained with nonoperative treatment, surgical proceedings must be considered in order to correct the position and, if possible, the mobility of the eye, so that binocular single vision would be restored, at least in the central part of the field of fixation; a good result would, at the same time, remove the anomalous position of the head. There are few operations in ophthalmology so satisfactory as the operations under discussion, provided the oculist has carefully chosen the method best suited to the particular case and provided that, if the case is so complicated that the desired result cannot possibly be obtained by a single operation, the patient has sufficient faith and perseverance to undergo several operations.

The paralytic deviation of one eye must be corrected, if possible, by increasing the efficiency of the paralyzed muscle. This result can be obtained by advancing or shortening the muscle, even if the paralysis is incurable. Wrongly assuming that an ocular muscle as an agonist must overcome the resistance of its antagonist, ophthalmologists formerly thought that the function of a paralyzed muscle might be improved by weakening the antagonist. However, Sherrington has shown that the lengthening of an antagonist in the normal act of vision is not to be understood as a passive stretching produced by the contraction of the agonist, but is due to an active relaxation that takes place even if the agonist does not function at all. It is now realized that it is impossible to improve the function of a paralyzed ocular muscle by weakening its antagonist.

It is due principally to Landolt's persistent propaganda that oculists have

gradually ceased to employ tenotomy in every case of deviation, regardless of its origin. Although paralytic squint may be improved by tenotomizing the antagonist of the paralyzed muscle, this advantage is more than outweighed by the addition of postoperative insufficiency of a normal muscle to the paralysis of its antagonist. In a case of paralysis of the right abducens nerve the result of tenotomizing the internal rectus would be that in the whole field of fixation there would possibly be only one direction of gaze in which the patient could see single. Homonymous diplopia would occur in looking to the right and crossed diplopia in looking to the left side of that direction. Landolt has indeed overshot the mark in his absolute rejection of weakening operations. A long-standing, permanent paralytic deviation of high degree due to a strong secondary contracture of the antagonist cannot be corrected solely by advancement or shortening of the paralyzed muscle. Landolt recommended that if the result of advancement—for instance, of the left external rectus—is not satisfactory, the right external rectus muscle should be advanced in preference to tenotomy of the left internal rectus, which would involve risking insufficiency of this muscle. If the secondary contracture of the left internal rectus muscle in the example mentioned is not corrected and the normal muscle balance of the right eye is destroyed by advancing the external rectus muscle, both eyes will be directed to the right in the position of rest, so that the patient, in order to look at an object in front of him and see it single, will be obliged to turn his head to the left. A habitual anomalous position of the head is certain to result from Landolt's procedure. In the cases under discussion the strong secondary contracture of the internal rectus muscle must be remedied by recession of that muscle with a safeguard-

ing suture preventing an abnormal weakening of the muscle. There is no objection to this, since its excessive function, which does not help the patient in the least, can be reduced to its normal measure without the risk of any disadvantage in the act of seeing.

OPERATIVE TREATMENT OF ABDUCENS PARALYSIS

Advancement and shortening of a paretic external rectus muscle is the operation of choice in uncomplicated cases. This will correct a deviation up to 15 or 20 degrees and restore binocular single vision in the greater part of the field of fixation. The abduction of the paretic eye can become nearly normal.

If the muscle is totally paralyzed, its function cannot be restored, and one must be content to restore binocular single vision in the central part of the field of fixation by improving the position of the paralyzed eye and of the head. The prognosis is much better if the loss of function is caused not by a paralysis but by an unguarded tenotomy, as will be seen in the photographs (fig. 52) of a patient whose internal rectus muscles were tenotomized because of a convergent squint 50 years before she consulted me. The internal rectus muscles, the tendons of which had receded behind the equator, were unable to move the eyes inward beyond the midline. The advancement of these muscles not only produced parallelism of the visual lines when the patient looked straight forward, but also restored a normal amount of adduction. It is easy to understand why the results obtained by one and the same operation differ so fundamentally according to whether the loss of function is caused by paralysis or by recession of the separated tendon beyond the equator. In the latter case the muscle, if innervated, contracts normally, although the effect remains

latent as long as the muscle is attached to the posterior half of the bulbus, whereas the paralyzed muscle does not obtain any innervation even after the operation.

Transplantation of the temporal halves of the superior and inferior rectus muscles to the site of the paralyzed external rectus was first recommended by Hummelsheim (1907). It has not been used as much in Germany as in this country, so far as I can judge from recent publica-

but in the majority of cases the deviation is of a greater degree, owing to secondary contracture of the internal rectus muscle. Since the adversion in these cases is abnormally increased, in addition to advancing the external rectus muscle the internal rectus should be receded in the manner already described, so as to bring its function down to just normal.

In a third group extreme contracture of the internal rectus muscle holds the



Fig. 52 (Bielschowsky). Total loss of function of both internal rectus muscles due to an unguarded tenotomy. There is deficient adduction of each eye in levoversion and dextroversion (A and B). After advancement and shortening of the internal rectus muscles the visual lines are parallel (C) and the adduction of both eyes has become normal (D and E).

tions. Fairly good results are reported, but in all these cases the transplantation was combined with tenotomy of the internal rectus muscle. I have performed transplantations in several cases, but the results were not so satisfying as to induce me to abandon the other and simpler procedures in the cases under discussion. By transplantation one may obtain a decrease in the deviation and even a certain amount of power of abversion, but the patient will not be able to see objects in front of him single with the normal position of the head, and he will not abandon the habit of anomalous rotation of the head toward the paralyzed side.

In long-standing cases of permanent abducens paralysis I make the mode of procedure dependent on the behavior of the antagonistic internal rectus muscle. My main endeavor is to obtain comfortable binocular single vision in the central part of the field of fixation, so that the normal position of the head is regained. If, in spite of total paralysis the deviation is below 15 degrees, the desired result is obtainable by simple advancement and resection of the paralyzed muscle;

visual line nearly immovable at the inner canthus. In most cases of this type the paralysis is caused by fracture of the base of the skull. An example is shown in figure 53A to F.

The patient, an automobile racer, had been unable to race for more than two years because of disturbing diplopia. He had consulted many oculists and had been told that his condition was inoperable. The man could be made fit to resume his work only by providing him with binocular single vision in the primary position of his head and eyes. To obtain this, the function of the enormously contracted right internal rectus muscle had to be sacrificed almost completely. I resected 15 mm. of the internal and advanced the external rectus muscle as far as possible in order to prevent a disfiguring exophthalmos. The photographs show the result: In looking straight forward with the head in its normal position the visual lines are parallel and are kept in this position without effort. Although the side-to-side movements of the right eye are almost abolished, so that the patient has homonymous or crossed diplopia, as

he looks to the right or to the left, he is happy because he can race as successfully as before his accident. He is not disturbed by diplopia because he substitutes the lost eye movements by the corresponding movements of his head; in near work he uses spectacles with one opaque glass. More than nine years have passed since the operation and he has recently written me of another race that he has won.

I have repeated the procedure described, in several similar cases, with good results. It is surprising how quickly, usually within a few days, the patients learn to avoid diplopia by turning their heads

OPERATIVE TREATMENT IN TROCHLEAR- NERVE PARALYSIS

Comparing the function of the external rectus muscle with that of the superior oblique, it is obvious that paralytic deviation in trochlear-nerve paralysis cannot be corrected so easily as in paralysis of the abducens nerve, for in the former three deviation components must be considered: a vertical, a rotating, and a lateral component; the last, however, is of subordinate importance.

Before one can decide whether and how a vertical deviation can be corrected by operation, the following questions



Fig. 53 (Bielschowsky). Paralysis of the right external rectus with extreme contraction of the internal rectus muscle. There is extreme deviation of the paralyzed eye while the other eye is looking straight forward (A). Excessive adduction of the right eye occurs if the patient is looking to the left (B). The cornea of the right eye remains in nearly the same adversion if the patient looks to the right (C).

After operation the visual lines are parallel in the primary position of the eyes and there is binocular single vision of distant objects (D). The right eye remains in the primary position if the left eye is looking to the right (E). Adversion of the right eye is restricted a little in looking to the left (F).

as a substitute for the lost muscular functions, and so unobtrusively that persons with whom they are talking do not notice the absence of certain ocular movements.

Sometimes the paralyzed eye is used permanently for fixation because of amblyopia of the nonparalyzed eye. As a rule, considerable contracture develops in the internal rectus muscle of this eye. In such cases this muscle may be weakened without danger, since neither diplopia nor an anomalous position of the head need be feared. Otherwise the weakening of the internal rectus muscle of the paralyzed eye without simultaneous advancement of the external rectus muscle would give rise to an ugly exophthalmos. If a simple operation would produce the same cosmetic and functional result as a complicated operation the former must, of course, be chosen.

must be answered: 1. Does the vertical deviation increase in looking up or in looking down? 2. Is it different in the right and left halves of the field of fixation? 3. Are the double images of contours parallel in the whole field of fixation or only in a certain part, being inclined toward each other in the other part? 4. Does the tilting of the head around the sagittal axis without changing the direction of the visual lines influence the magnitude of the vertical and the meridional deviation, and, if so, in what manner? Only after these questions have been answered by a careful examination is one in a position to know whether the deviation is due to nonparalytic heterophoria or to paralysis of one or several vertical motor nerves of the right eye or the left, and what operative procedure to adopt.

I shall consider first the procedure in a typical case of inveterate trochlear-nerve paralysis that presents both vertical and meridional deviations, increasing or decreasing in the various parts of the field of fixation. I do not think it advisable to strengthen the function of a paralyzed superior oblique muscle because of its insertion in the posterior half of the globe. The disturbed vertical balance of the eyes—namely, the disturbed harmony of position and movements of the eyes—must be restored in another way. But tenotomy of the superior rectus muscle of the eye with the paretic superior oblique is a wrong method and must be definitely rejected because it ignores the physiologic functions of the vertical motors. One might indeed obtain an improvement, possibly even a removal of the vertical deviation due to trochlear-nerve paralysis, through weakening of the superior rectus muscle, but only for a small central part of the field of fixation. In the lower half, where the vertical deviation had been greater before the operation, the effect of the operation is less than in the central part; whereas in the upper part, where there had been only a small vertical deviation or none at all before the operation, there may even be an overcorrection; that is, the contrary vertical deviation. If the patient is looking toward the sound side, the vertical position of the paralyzed eye depending mainly on the oblique muscles, the vertical deviation due to paralysis of the trochlear nerve increases in proportion to the increasing adversion of the paralyzed eye, whereas it decreases in looking to the opposite side, because the vertical position of the abverted eye is influenced mainly by the vertical rectus muscles. Instead of getting the maximum operative effect on the paretic deviation of the abverted eye, tenotomy of the superior rectus muscle produces the maximum effect

on the abverted eye and the minimum on the adverted eye, again an undesirable result. More unsatisfactory still is the effect of tenotomy of the superior rectus muscle on the meridional deviation (disclination) in trochlear-nerve paralysis. This deviation is increased by weakening the superior rectus, which is likewise an inward rotator muscle. The same disadvantage is also prejudicial to the effect of an advancement of the inferior rectus muscle, as recommended by Landolt for trochlear-nerve paralysis. The only advantage of this operation compared with tenotomy of the superior rectus muscle is a better correction of the vertical deviation in the lower part of the field of fixation, but only in its central part, as it is inadequate in the nasal quadrant of the lower half of the field of fixation.

Albrecht von Graefe's genius and his familiarity with the physiology of the muscles of the eye revealed the right way in which to remedy the aftereffects of paralysis of the trochlear nerve. He was the first to perform tenotomy of the inferior rectus muscle of the sound eye in order to equalize the function of the associated depressor muscle of the two eyes. Stevens, Worth, Landolt, and other eminent authors have objected to Graefe's procedure because, while the weakening of the sound inferior rectus muscle would perhaps yield a good result as regards the primary position of the eyes, it would cause an overcorrection in looking down. This possibility must of course be considered, but it can be avoided if the inferior rectus muscle is not simply tenotomized but weakened just to the extent needed to counterbalance the weakness of the paralyzed superior oblique muscle. If this is successful, the vertical and the meridional deviation will disappear in nearly the whole field of fixation, and the normal position of the head will be restored. This is easy to understand if one

considers that the left superior oblique and the right inferior rectus muscle are associated in so far as both these muscles have the maximum influence as depressor muscles if the eyes are turned to the right and the minimum influence in the opposite side of the field of fixation; further, they incline the upper end of the vertical meridians to the right, so that the extorsion (disclination) caused by a paralysis of the left trochlear nerve is diminished or even transformed into parallelism when the right vertical meridian, by weakening of the right inferior rectus

near the region where it turns into the fornix or, if a high degree of vertical deviation must be compensated for, within the fornix. The ligature is tied loosely, not knotted twice, so that I am able, if necessary, to lessen or intensify the effect of the operation the following day. A careful suture of the conjunctival wound is necessary to prevent drooping of the lower lid, producing a poor cosmetic result. Figure 54A-F and figure 55A, B show examples of compensatory weakening of the left inferior rectus muscle in cases of paralysis of the trochlear nerve. Drooping of

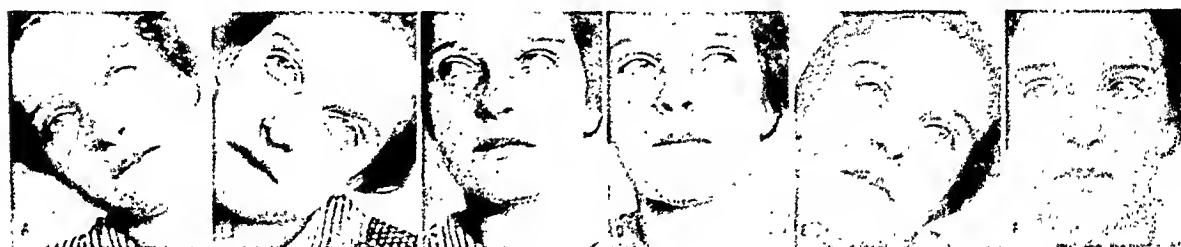


Fig. 54 (Bielschowsky). Paralysis of left trochlear nerve with habitual torticollis: binocular single vision with the head tilted toward the right shoulder (A); considerable left hypertropia when the head is tilted toward the left shoulder (B); left hypertropia if the eyes are turned to the right (C); while the hypertropia disappears in levoversion (D).

After retroplacement of the right inferior rectus, binocular single vision even while the head is tilted toward the left shoulder (E) or the eyes are turned to the right (F).

muscle, is rotated inward; that is, to the same (left) side as the left vertical meridian. The oblique position of both vertical meridians does not interfere with vision, provided they have become nearly parallel. This so-called compensatory operation has proved successful in many cases of paralysis of the trochlear nerve when indispensable precautions have been taken to prevent overcorrection.

I perform this operation in the following manner: After the conjunctival incision, the inferior rectus muscle is separated from the fascia and the fibers connecting the muscle with the conjunctiva. Then the needles of a double-armed suture are inserted through the tendon from the posterior to the anterior surface and through the conjunctiva bulbi, but through the peripheral part of the latter,

the lower lid occurred after a simple tenotomy of the inferior rectus muscle (fig. 55A). A careful suture of the conjunctival wound following recession of the inferior rectus muscle prevented drooping of the lower lid (fig. 55 B).

In the majority of cases of incurable paralysis of the trochlear nerve a contraction of the inferior oblique muscle prevents the decrease of the vertical deviation in looking upward as seen in typical cases, and finally the deviation becomes entirely independent of vertical movements, as was discussed in the second lecture. In these cases, recession of the inferior rectus muscle of the other eye can, to be sure, correct the deviation in the lower half of the field of fixation, but it is not sufficient for the correction in the upper half and in the horizontal plane.

Since, in most cases of this kind, the function of the inferior oblique muscle is excessive, it may be weakened by severing it from its origin and resecting a few mil-



Fig. 55 (Bielschowsky). Compensatory weakening of the left inferior rectus muscle in a case of paralysis of the trochlear nerve. Drooping of the left lower lid occurred following a simple tenotomy of the inferior rectus muscle (A). After a careful suturing of the conjunctival wound following recession of the inferior rectus muscle there is no drooping of the lower lid (B).

limeters of it. There is no danger of obtaining an overeffect, as I was able to verify in more than 50 cases. If a considerable amount of vertical deviation remains in the lower part of the field of

as the first sign in earliest infancy, inducing the child's mother to consult a physician. In the second lecture I spoke of the orthopedic and surgical treatment that is frequently given in such cases, because the practitioner overlooks the ocular origin of the torticollis. In most cases of this kind it is as surprising as it is gratifying to observe the child spontaneously straightening the formerly tilted head as soon as the ocular-muscle balance has been restored. This fact is easy to understand: The tilting of the head helps the patient to avoid diplopia, which is caused by the excessive functioning of the inferior oblique muscle or of the insufficiency of its antagonist, as the case may be. That the disturbed balance between the oblique muscles is the only reason for the habitual tilting of the head is proved by the results of myectomy of the in-



Fig. 56 (Bielschowsky). Divergent strabismus (right eye) with overfunction of the right inferior oblique. In the primary direction of gaze the right eye is deviated out and slightly up (A); in levoversion the excessive functioning of the right inferior oblique brings about a considerable right hypertropia (B). After bilateral advancement of the internal rectus with a displacement of the right one below the horizontal meridian perfect parallelism of the eyes (C); even in levoversion no right hypertropia is noticeable (D).

fixation some weeks after the myectomy of the inferior oblique muscle, one may proceed to recession of the inferior rectus of the other eye, as has been previously described. To perform these two operations in the reverse order is less expedient, because it is easier to bring about a gradation of the effect in a recession of the inferior rectus muscle than in myectomy of the inferior oblique.

Similar to the cases under discussion are the cases of congenital anomalies, which I have described as overaction of the inferior oblique muscles, from the lack of evidence indicating primary trochlear-nerve paralysis. In almost all the congenital cases torticollis is displayed

inferior oblique muscle followed, if necessary, by recession of the inferior rectus muscle of the other eye. As soon as the vertical deviation and the meridional disclination have been corrected and binocular single vision has been restored with the head in the normal position, the tilting of the head is abandoned.

The congenital overaction of one or both inferior oblique muscles is sometimes combined with a nonparalytic squint. If the former anomaly is not of too high a degree, it can be corrected by displacing one or both of the horizontal rectus muscles below the horizontal meridian of the bulbus. As a rule, the usual advancement and recession opera-

tions of the external and internal rectus muscles are sufficient also for the correction of the vertical deviation just discussed. Figure 56A to D shows a patient with a divergent squint of 25 degrees combined with an exceedingly high degree of so-called overaction of the right

sixth- and fourth-nerve paralyzes cannot, of course, be obtained in total paralysis of the oculomotor nerve, mainly because of the simultaneous deficiency of both the elevator and the inferior rectus muscles. In most cases, however, one can obtain not only a cosmetic improvement but also



Fig. 57 (Bielschowsky). Paralysis of the right oculomotor nerve due to tabes dorsalis. The upper lid cannot be raised voluntarily (A), but is lifted involuntarily when a levoversion impulse is given (B) to which the right internal rectus does not react. After an advancement and shortening of the right internal rectus and recession of the right external rectus, the visual lines are parallel in the primary position (C), binocular single vision is restored, adversion considerably improved (D), and abversion is normal.



Fig. 58 (Bielschowsky). Paralysis of the right oculomotor nerve due to fracture of the base of the skull six years previously. Right eye immovable, except outward, marked ptosis (A), which disappears when an impulse for levoversion is given (B). Result of an advancement of right internal and recession of right external rectus binocular single vision in primary direction of gaze (C) and in the right half of the field of fixation. Surprising restoration of adversion of right eye (D).



Fig. 59 (Bielschowsky). Bilateral paralysis of oculomotor nerve (A). Binocular vision for primary direction of gaze restored by operation; parallelism of visual lines in primary direction (B); adversion missing in lateroversion (C and D).

inferior oblique muscle. Advancement of the internal and recession of the external rectus muscles of both eyes effected perfect binocular single vision. In such cases, if the result concerning the vertical deviation component is not adequate, a myectomy of the inferior oblique muscle is required.

As great an improvement as in the

binocular single vision, at least in a certain central part of the field of fixation. The first and main task to be accomplished is the removal of the paralytic divergence by advancing and shortening the internal rectus combined, if necessary, with weakening the antagonist. When parallelism of the visual lines is obtained, the patient learns quickly to find the posi-

tion of the head in which balance exists between the vertical motor muscles and to replace the deficient vertical movements of the eyes with corresponding movements of the head.

The photographs (figs. 57A to 60C) of some of my patients with total paralysis

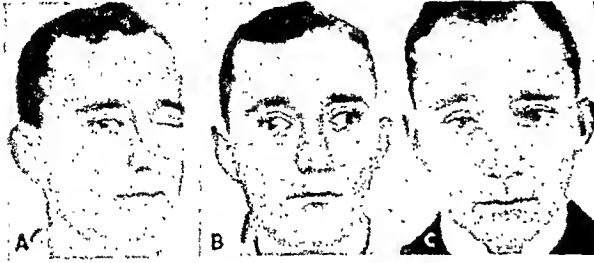


Fig. 60 (Bielschowsky). Total paralysis of both third nerves with enormous secondary contraction of both external rectus muscles caused by congenital syphilis. The patient habitually turned his head to the left in order to fixate an object straight in front of him; the left eye closed to avoid diplopia (A). In the primary position of the head, the paralytic deviation amounted to 60 degrees (B). After advancement and shortening of both internal rectus muscles and recession of both of the external rectus muscles there is binocular single vision with the head in the normal position, the visual lines being parallel in looking straight forward (C).

of one or both oculomotor nerves may show cosmetically satisfactory if not always functionally perfect results obtained by advancement of the internal and recession of the external rectus muscles.

I should like to say a few words about

cle is substituted for the paralyzed levator palpebrae, should be the operation of choice. This procedure, based on the physiologic synergy of the movements of

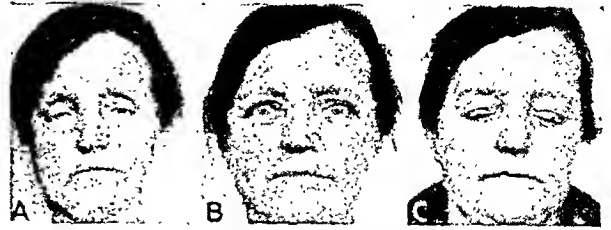


Fig. 62 (Bielschowsky). Result of the von Blaskovics operation in a case in which the Motaïs operation was not applicable on account of a paralysis of the superior rectus muscles. The upper lids cover the upper halves of the corneas (A). After a von Blaskovics operation the lids assume a normal position (B). They can be relaxed when the eyes are looking down (C) just as completely as after a Motaïs operation.

the eyeballs and the upper lids, gives highly satisfactory results; but it is not advisable to use it on young children, because a child's superior rectus muscle is so small and delicate that the suture may easily cut through it. The photographs (figs. 61A to E) show a case of congenital bilateral ptosis. The palpebral fissure can be opened a little only by a strong innervation of the frontalis muscle. The successful result of the Motaïs operation, performed on both eyes, is seen in the photographs. The upper lids accom-

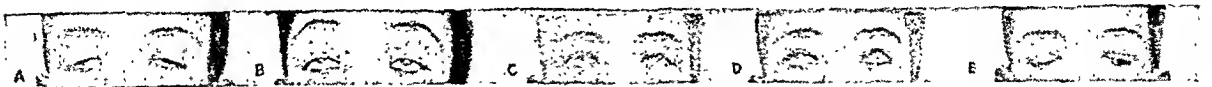


Fig. 61 (Bielschowsky). Congenital bilateral ptosis. The lid fissures are narrow (A); they can be opened a little more only by a strong innervation of the frontalis muscle and by an upward movement of the eyes (B). After a Motaïs operation there is binocular single vision in the primary position (C), in looking up (D), and in looking down (E). Both upper lids accompany the vertical movements of the eyeballs in the normal way. Particularly valuable is the complete relaxation of the elevator muscles of the upper lid in looking down; this cannot be obtained by the Hess operation.

ptosis operations. For all patients whose superior rectus muscle functions normally, the Motaïs operation, in which the middle third of the superior rectus mus-

pany the elevation as well as the depression of the eyes in the normal physiologic manner and are also in the normal position in looking straight forward. When

the Motais operation is not applicable, because of the complete absence of function of the superior rectus muscle, the operation recommended by von Blaskovics gives the most satisfactory results, as is demonstrated by the photographs (fig. 62A to C). The upper lids cover the upper halves of the corneas (A). After a von Blaskovics operation the lids assume a normal position (B). They can be relaxed just as completely when the eyes are looking down (C) as after a Motais operation. In this

operation a fragment of the superior tarsus is removed, and after resection of its peripheral part the levator muscle is attached to the residue of the tarsus. The Hess operation is still popular because of its simple technique, but it does not allow for the physiologic synergy of the lid and ocular movements, since the upper lid, after it has been attached to the frontalis muscle, cannot be lowered when the eyes look down. I have therefore abandoned this operation.

MIXED-CELL TUMOR OF THE LACRIMAL SAC*

JOSEPH L. McCool, M.D.
San Francisco

Mixed-cell tumors occur commonly in the salivary, parotid, and lacrimal glands and in the buccal mucosa. Mixed tumors of the lacrimal sac are very rare.

These neoplasms are of complex structure, usually presenting epithelial elements in the form of cell strands and neoplastic tissues, chiefly cartilage, mucous tissue, and connective tissue. Any one of these elements may predominate, forming nearly pure chondromas, sarcomas, or carcinomas, but usually all the cell types are represented.

There has been a controversy regarding the origin of these tumors, some writers maintaining that they are epithelial, others claiming that they are endothelial in origin. Of late, the theory of the endothelial origin of these growths has been abandoned, but their histogenesis is by no means complete, as no single source meets all the requirements, some being adenomatous, others extraglandular, and taking the form of basal-cell epitheliomas.

Age appears to play no part in their formation, cases being reported in patients from 11 months to 73 years of age.

The clinical course varies greatly, depending largely upon the histologic type of the tumor. After removal, encapsulated growths rarely recur, although occasionally surgical interference is followed by recurrences of increasing malignancy, the secondary growth becoming more cellular. Thus spindle-cell and round-cell sarcomas have been observed after extirpation of chondrocarcinoma.

De Vincentiis¹ in 1877 was probably the first to report a case of epithelioma of the lacrimal sac, and he pointed out the danger of confusing this with the thickened sac wall of dacryocystitis.

Piccali² in 1895 and Dalén³ in 1901 published cases of epithelioma of the lacrimal sac, the latter's case occurring in a man aged 24 years, following extirpation of the sac. Guibert in 1905 mentioned an epithelioma that was cured by the X ray after eight treatments were applied

* Read at the Seventy-fourth Annual Meeting of the American Ophthalmological Society, at San Francisco, California, June 9-11, 1938.

over a period of four months. The radiographer observed that improvement was attained only after fairly intense radio-dermatitis had been produced.

Following Guibert, Rollet⁴ in 1906 reported two cases in which the sacs were extirpated because of slight swelling and a concomitant dacryocystitis. Microscopic examination showed the sacs to be filled with neoplastic tissue.

Posey's⁵ second case was that of a man, aged 74 years, who had what was believed to be a mucocele of the lacrimal sac. The sac was extirpated. During the operation the sac wall ruptured, discharging a small quantity of pus. The mass was about the size of a horse chestnut and, when examined microscopically, proved to be a primary tubular epithelioma. To obviate a recurrence, radium tubes were applied on three different occasions, and after two years no recurrence was noted.

Morestin⁶ in 1908 reported a case in which radiotherapy had failed. Sac extirpation with transplantation of a forehead flap brought about a good result.

Pasetti⁷ in 1913 published a most comprehensive paper reviewing the literature and adding a case of his own, occurring in a man, aged 73 years, in whom the tumor was the size of a small nut, the overlying skin being normal and readily movable over the mass. The growth was of hard consistency, and there was no sensation of fluctuation. The cavity of the sac was obliterated, except in its central portion, where, on extirpation, a purulent secretion was found. Pasetti asserts that although tumors of the sac are rare, the surgeon should always bear in mind the possibility of their occurrence, and, in all suspected cases, should advise extirpation rather than other forms of operative procedure. Despite apparently complete removal, recurrences are not uncommon.

The case reported by Butler⁸ in 1914 was that of a girl, aged 17 years, from whom a tumor of the lacrimal sac was removed that later proved to be a small round-cell sarcoma. The earliest sign was edema and thickening around the sac, with occlusion of the lacrimal duct. Butler believed the lesion to be tuberculous and advised extirpation. Later there was a recurrence in the orbit and antrum of the same side and an extension through the palate to the opposite side of the face and the other antrum and orbit. With recurrence the morphology of the growth changed and it became a so-called spheroidal-cell sarcoma in which many cartilage cells could be seen. Surgery, of course, failed to check the progress of the disease, and the patient died.

Sarcomas of the lacrimal sac have been reported by Sgrosso,⁹ Maauro,¹⁰ Silvestri,¹¹ Matteson,¹² Maggi,¹³ Butler,⁸ Zannoni,¹⁴ Singer,¹⁵ Strado,¹⁶ and Margotta.¹⁷

Papilloma and malignant papilloma were reported by Denti,¹⁸ Hildén,¹⁹ and Heich.²⁰

Verhoeff and Derby²¹ and Cardello²² reported cases of plasmoma of the sac.

Lymphomas were reported by Weave,²³ Cavaniglia,²⁴ and by Sédan, Astier, and Caudière.²⁵

CASE REPORT

The case which I wish to present is that of a man, aged 54 years, who consulted me in April, 1931, complaining of tearing and the presence of a mass in the region of the left lacrimal sac. He had first noticed lacrimation about six months before consulting me, but paid no particular attention to this until some months later, when he became conscious of a small lump over the site of the lacrimal sac. Although the mass was not painful at any time, the growth was increasing in size and made the patient apprehensive as to its nature.

The lids, conjunctiva, and anterior ocular segment were normal. An attempt to pass a solution through the drainage apparatus, of course failed. There was no discharge through either punctum as a result of this procedure.

On inspection, the mass appeared to be about the size of a small cherry, and occupied the site of the lacrimal sac. Inasmuch as the skin over the mass was normal in color and not particularly tense, I assumed that I had to deal with a mucocele of the sac. However, upon palpation the skin was found to be of normal texture, and freely movable over a small, almost bony hard mass. This mass was not painful to palpation, and no secretion exuded through either punctum as the result of pressure. Its position and slight mobility argued against a diagnosis of exostosis, and its density against that of a mucocele.

The mass was extirpated without difficulty, as it was not adherent to the surrounding structures.

Pathologic report.—Gross examination: A soft, yellowish, translucent mass, measuring 1 by 1 by 1.5 cm.

Paraffin section.—At one edge of the section there was ciliated epithelium; in the underlying tissues there was marked round-cell infiltration which in places formed lymphoid nodules. Separated from this by a dense connective-tissue septum was a mass of apparently neoplastic tissue composed of a mixture of fibroblastic tissue, round cells, and cells of indefinite shape, with somewhat large, quite clear nuclei, oval or round in shape, and without distinct nucleoli. Mitotic figures were common in some areas among these cells. Clear myxomatous areas were present in a small amount. There was infiltration of all the types of tissue between the striated muscle fibers at the edges.

The picture presented was that of a mixed-cell tumor similar to those so fre-

quently seen in the salivary glands (myxochondroepithelioma).

Diagnosis.—Mixed-cell tumor of the lacrimal sac.

As soon as the malignant character of the lesion was established from the pathologic report, the patient was referred to Dr. Laurence Taussig, who implanted radium in the cavity from which the tumor had been removed.

I saw the patient 10 months after the operation and there had been no recurrence. I realize, however, that so short a time does not preclude the possibility of a recurrence, but inasmuch as I have not seen the patient since, I am unable to say whether there have been any metastases or whether the patient is still living.

LYMPHOBLASTOMA OF LACRIMAL SAC, SUBSEQUENTLY AFFECTING THE ENTIRE LYMPHATIC SYSTEM (Sédan, Astier, and Caudière)

A woman, aged 44 years, appeared at the Hospital of the Conception on July 25, 1938, suffering from a seemingly trifling lacrimal disease resembling dacryocystitis, complicated by a large but not painful abscess. When the abscess was opened, only a small amount of pus escaped. The operative reactions were normal, and at the end of three weeks the only thing remaining was a large painless lump. The patient then consulted another physician who performed a series of painful cauterizations. At the end of 30 days the patient began to see double. She returned to her first doctor, who found an absolutely painless tumor occupying the internal angle of the eye, pushing the eyeball outward. The neoplasm grew so rapidly that the patient decided upon an operation. When the lacrimal sac was removed, it resembled in shape and consistency a lobulated suet pudding; it was connected with an intra-orbital mass of the same appearance. The

latter was removed at a second operation. The appearance of the sac is best described by comparing it microscopically with the tissue of the pancreas and the salivary glands.

The patient went home on the sixth day. Diplopia had disappeared, vision was perfect, and it remained so throughout the course of the disease. Three weeks after the operation the tumor reappeared very suddenly. In the course of a few days it became as large as the growth that had recently been removed. Radiotherapy was tried, a total dosage of 4,000 roentgen units being given. With seven treatments the tumor vanished completely; the diplopia disappeared after three treatments, the only sequelæ being rarefaction of the fat in the cavity, a slight enophthalmos, and a convergent strabismus. On August 20th the preauricular lymphatic system became greatly involved. From August to December the tumor invaded the cervical chain of lymphatics. During December and January the malar regions, the inguinal region, and finally, by the end of January, the mediastinum, became involved.

Each radiation series was entirely successful. Tumors in the regions treated disappeared within 20 days, to appear later in more remote regions. The extreme malignancy of the tumor, rather than radiotherapy, was responsible for the metastases.

After the axillary and inguinal glands became involved, dyspnea, suffocation, and cachexia occurred, and the patient died on March 1, 1929, seven months after the tumor was first diagnosed.

Histopathologic examination.—A diagnosis of lymphoblastoma was made. After fixation with Bouin's fluid, the tumor was found to be extremely homogeneous. Throughout, the growth was composed generally of round or oval elements. These were independent of one another, juxtaposed with free intercellular spaces be-

tween. With the exception of occasional capillary vessels, they alone composed the tumor.

After staining, the cells appeared as large and round, in general measuring from 10 to 15 microns, occupying four fifths of the entire mass, with fairly clear nucleus, and infrequent and small chromatic granules. The nucleus was surrounded by a thin protoplasmic covering; occasionally the cytoplasm was more abundant, and on one part of the periphery at least overflowed the nucleus enough to be easily seen.

After coloration with hematin, eosin, and saffron, the cytoplasm was a deep violet blue, and the dark-blue nucleus showed more clearly the structure already described.

After the use of Giemsa's stain, the results were especially clear. The cytoplasm was a dark blue, absolutely homogeneous, without a trace of granulation; the nucleus was reddish purple, and clearly showed its structure and its karyosomes. Mitosis occurred throughout the tumor. Occasionally small, homogeneous elements with a dark-blue nucleus were found; these had a basophile cytoplasm, while resembling lymphocytes rather than lymphoblasts.

The connective tissue constituting the stroma of the tumor was practically nonexistent; connective-tissue fibers were lacking, and blood vessels were rare. From this it was deduced that the cells of the neoplasm were of lymphoid origin, representing cells only slightly differentiated from lymphoblasts; for this reason the tumor was considered a lymphoblastoma.

LYMPHATIC TUMOR OF THE LACRIMAL SAC (Weve²³)

A man, aged 59 years, was operated on for tumor of the lacrimal sac. Among hundreds of surgical lacrimal-sac cases seen at the Rotterdam clinic, no tumor

had ever been found. Paraffin sections did not at once differentiate between a round-cell sarcoma and a lymphoma. The blood picture was: Hemoglobin, 90 percent; red blood corpuscles, 4,560,000; white blood corpuscles, 7,300. Leucocyte formula: basophiles, none; eosinophiles, 1 percent; myelocytes, 0.5 percent; juvenile forms, none; red nuclears, 4 to 5 percent; segment nuclears, 70 percent; lymphocytes, 17 percent; large mononuclears, 4.5 percent. The cervical lymph glands had been swollen for six months. The growth was removed by operation. It was diagnosed as a lymphoma, and could probably have been treated successfully with X rays.

PAPILLOMA OF THE LACRIMAL SAC (Heich²⁰)

A woman, aged 39 years, was examined on August 19, 1929. She complained of swelling at the site of the lacrimal sac, and of blood in the eye since August 16th. As a child she had had bleeding, and tumors were removed five times during childhood. Vision was 6/6 in each eye, and both eyes were normal.

Pressure over the right lacrimal sac released a blood-stained discharge through the punctum into the conjunctival sac, and on further pressure blood escaped.

A diagnosis of papilloma was made, and operation was decided upon. The lacrimal sac was greatly distended and the wall was very thin. Palpation revealed the presence of a firm, nodular swelling in the sac. Before dissection was completed the thin wall ruptured, revealing a large papilloma. The growth was very friable, and had to be removed in pieces. There was no evidence of recurrence.

Pathologic report.—Simple papilloma. The growth was composed of cylindric cells on a definite basement membrane with a vascular core of fibrous tissue.

PAPILLOMA OF THE LACRIMAL SAC (Denti¹⁸)

A woman, aged 50 years, was examined on November 19, 1920. Epiphora of the right eye had been present for several months, and at the same time a small, painless tumor developed at the internal angle of the affected eye. Pressure released some pus.

Examination disclosed a round, soft, elastic, and painless swelling in the region of the right lacrimal sac. Pressure released a few drops of pus.

Diagnosis.—Chronic dacrocystitis with ectasia of the lacrimal sac.

Operation.—Local anesthesia. The sac was removed *in toto*, and a section through the largest diameter of the mass was made. The mass was grayish-red in color, about the size of a pea, gelatinous in consistency, and adherent to the inner wall of the sac.

The tumor was fixed in a 10-percent solution of formalin. Some sections were cut with the microtome, and others were immersed in paraffin.

The papillomatous structure of the growth was rendered apparent under slight magnification, and under higher power the papillæ presented a central stroma composed of connective tissue with many blood vessels; within this stroma there were collections of lymphoid cells. The stroma was enveloped by a stratified epithelium. There was no sign of a typical proliferation, and absence of mitosis was also noted.

MALIGNANT LACRIMAL-SAC PAPILLOMA, BEING ALSO AN EXAMPLE OF CELLULAR METAPLASIA OF THE LACRIMAL SYSTEM (Hildén¹⁹)

Neoplasms of the lacrimal system are very rare. According to Hildén, only one case of papilloma of the lacrimal sac was found in the literature (Hermann). Sev-

eral cases described as papilloma had been considered histologically unsustained by Hock and Presbergen. These authors believe that the growths were inflammatory granulations.

A youth, aged 18 years, had lacrimation for several months, when minute tumors of the lower caruncle developed. These were removed, but recurred. A portion of a tumor that was accessible was cut away and the growth was diagnosed as a papilloma. The numerous mitoses, however, did not appear to be entirely benign. The papilloma displayed several layers of stratified epithelium. The lower layers contained prickle cells with intercellular communications. The horny layer was well defined, with epithelium and connective tissue definitely separated. There was abundant vascularization. The tumor recurred in three months, and for this reason the lacrimal ducts were slit. The growth was found to have filled completely the sac to which it was adherent. The sac was removed. Histologically, it proved to be a typical papilloma.

LYMPHOMESOTHELIOMA OF THE LACRIMAL SAC (Cavaniglia²⁴)

The patient, a man aged 50 years, reported that for about six months he had had a watering of the right eye and had observed in the internal angle a small swelling which was not painful even to pressure. Examination showed a swelling the size of a small hazelnut in the lacrimal sac. There was no evidence of inflammation, since it appeared to be a chronic dacryocystitis with ectasia of the lacrimal sac, and moderate pressure forced out a viscous yellow liquid. Laboratory tests, the Wassermann test, urine test, skin test, were all negative. The tumor was removed in the usual manner by extirpating the lacrimal sac and thor-

oughly scraping the nasal lacrimal canal.

Histologic report.—A fragment of the tumor was fixed in a 10-percent solution of formalin, and microtome sections were stained with eosin, Giemsa's stain, and so forth. Throughout the connective-tissue stroma, with alveoli varying in size and shape, there was a parenchyma composed of elements with a protoplasm colored by an acid stain and a relatively small nucleus. A few neoplastic cells appeared in the mesothelium of the lymphatic spaces. Although karyokinesis was rare, and sometimes atypical, it was easy at this point to observe discrete division. Throughout the stroma of the blastoma was an inflammatory infiltration with polynuclears, lymphocytes, and a few plasma cells.

PLASMOMA OF THE LACRIMAL SAC (Cardello²²)

The patient was a man, aged 54 years, suffering from chronic dacryocystitis and epiphora affecting both eyes. In the lacrimal secretion were numerous plasma cells. The left lacrimal sac was removed.

Microscopic examination.—In the first sections containing the capsule an enormous circumscribed infiltration was found. The mass was surrounded by bands of connective tissue, forming almost a capsule, which continued into the connective tissue. The submucosa infiltration continued in the form of an involucre. The intraparietal mass advanced in polypoid form into the cavity, partially occupying it, and then became smaller until, in the intersections, it was observed mainly as a uniform subepithelial formation. In some sections in the center of the mass there were formations that presented a glandular aspect and were made up of large cylindric cells with a great amount of protoplasm.

Numerous polymorphonuclear leuco-

cytes were found immediately under the epithelium, as mentioned above. The epithelium was proliferated in one part and in another it was exfoliated, leaving large areas empty.

Staining by Pappenheim's method showed that the tumor was composed almost exclusively of plasma cells, with a few lymphocytes on a reticular stroma full of blood vessels. There were a great many cells of the epithelioid type, with a large nucleus and an irregular arrangement of the chromatin. Polymorphonuclear leucocytes were found not only within but also beside the vessels of the plasmoma, and were analogous to those which were found within the vessels of the periphery of the sac.

EPITHELIOMA OF THE LACRIMAL SAC (Pasetti⁷)

The patient was a man, aged 42 years. A hard, painless lump had appeared in the angle of the left eye about one year before he applied for treatment. The examination revealed a lump the size of a hazel nut, skin normal, slight secretion, and some reddening of the conjunctiva. The growth was diagnosed as a primary neoplasm of the lacrimal sac. On operation the tumor appeared to be fibrous. Hemorrhage was only slight.

Sections of the tumor, fixed and mounted in paraffin, were stained according to Bielschowsky's and van Gieson's methods.

The substance of the tumor appeared to be composed of numerous zones, round in form, and with ramifications. These zones were more deeply stained, due to the abundance of nuclei, and were separated from one another by a prolific fibrous tissue with few nuclei.

Toward the center of the section there appeared stratified epithelium, in some points composed of several layers of cells. In the peripheral section of the tumor

interpapillary substance abounded. This substance was composed of very fine connective tissue developing principally in a horizontal direction. The cavity of the sac was not perceptible, nor was there any trace of its wall.

The cells were cylindric in shape near the periphery of the neoplasm, and cube-like or polygonal in the center of the mass. All these cells contained oval or round nuclei.

The arrangement of the cells in the connective tissue of the tumor was in a horizontal direction. The cells were elongated, with spindle-shaped nuclei, in the dense parts of the connective tissue. In other portions the cells were round, with large nuclei.

The epithelial tissue of the tumor contained a small amount of protoplasm, but no trace of intercellular substance. The nuclei were reticulated with chromatin. Karyokinesis was frequent.

Microscopic findings identified the tumor as of epithelial origin, anaplastic in type, derived from a developing epithelium. The cells were generally cylindric or polyhedral; their arrangement and appearance were partly like those of alveolar carcinoma and partly like papillary cancer. From its general appearance the neoplasm was considered malignant.

Diagnosis.—Primary carcinoma of the lacrimal sac with cylindric cells derived from cylindric epithelium of the mucosa of the lacrimal sac.

Death occurred soon after operation from a cause not related to the tumor.

EPITHELIOMA OF THE LACRIMAL SAC (Fenton)

A woman, aged 49 years, had been treated 16 years previously for an intractable roughening of the nasal skin near the inner canthus of the left eye. Salves and X rays had been used, but the lesion advanced across the bridge of

the nose, leaving the skin with the appearance of having been burned by the roentgen rays.

Three-and-one-half years ago a hard swelling appeared at the inner canthus of the right eye. Square plaques of radium relieved the pain and diminished the redness, but the swelling around the sac increased.

On examination on January 17, 1922, a smooth, hard, slightly tender swelling, including both the caruncle and the lacrimal sac, was disclosed. Epiphora was constant. The puncta were normal in size. Radical excision of the growth, including as much skin and periosteum as was possible, was done on January 20th, under gas and ether anesthesia. The inner thirds of both lids, the skin, and the periosteum of the lateral aspect of the nose, and the lacrimal sac as far down the nasal duct as possible, were extirpated. Both canaliculi and the caruncle were removed. The resulting circular defect left one third of the cornea bare, and measured 3 by 5 cm. in diameter. Finally 10 mg. of radium needles were stood upright in each nasal duct, and allowed to remain for seven hours. Normal drainage through the nasal duct occurred one week after operation.

Microscopically, there was seen an irregular mass of stratified squamous epithelium showing evidences of rapid growth. Malignant infiltration extended from the tissues around the eye along the wall of the lacrimal sac.

Pathologic diagnosis.— Squamous-cell carcinoma. Six weeks after operation the first plastic operation was done. Three months after excision of the growth the opening had been reduced to 15 mm. and the second plastic flap was made. Ten months after the excision the patient noticed an enlargement and hardening of the skin flap and that the eye became red and painful. A smooth, hard mass bulged

up under the flap, attaching it firmly to the lacrimal bone, and inhibiting abduction beyond 10 degrees. A prompt application of radium was made, and 3½ months later another application was made. The eye had again whitened, and the growth, although still hard, was smaller. Abduction was still limited.

SARCOMA OF THE LACRIMAL SAC (Matteson¹²)

The patient was a boy, aged 12 years. The tumor was first noticed two months previously. It grew rapidly until, at the time of examination, it had reached the size of a hen's egg. It was firm and elastic, and the skin and the tumor were adherent. Neither pain nor tenderness was present. The left eye was entirely normal.

Pathologic examination of a fragment of the mass disclosed it to be a small round-cell sarcoma.

At operation a tumor closely attached to the periosteum of the nasal and malar bone was found. The internal membrane was peeled off, leaving an apparently healthy base beneath. None of the orbital tissues appeared to be involved.

Thirty-six days after the growth had been extirpated a firm, small nodule could be felt in the cicatrix. Puffiness and induration of the skin flap were present. A few days later a moderate degree of exophthalmos was observed. Pain confined to the eyeball now appeared for the first time. The patient was discharged as incurable. Forty-four days after an operation, in which all the visible signs of the growth had been removed, recurrence had taken place, and the sarcoma could easily be recognized as arising from three foci—one under the reflected skin flap, arising from the vicinity of the nasal bone; a second deep in the orbit, and a third near the lower part of the malar bone.

One hundred days later the tumor had advanced through the orbit, pushing everything before it. The eye had been completely destroyed, and a few shreds of corneal tissue were all that remained. About a month later the boy died.

THREE CASES OF NONULCERATED CARCINOMA OF THE LACRIMAL SAC (Rollet⁴)

Case 1.

Latent primary carcinoma of the sac (epithelioma); extirpation of the sac *en bloc*.

The patient was a man, aged 65 years, who had suffered with epiphora for two years. For one year there had been a growth the size of a hazelnut in the internal angle of the left eye. Pressure released pus by nostril and canaliculi. Tumor was removed *en bloc*.

Microscopic section.—A fragment of the tumor and of the surrounding fibrous tissue was embedded in paraffin and stained. The wall was thick toward the anterior part of the sac, and fibers of the growth assumed a circular arrangement.

The internal surface of the sac was covered with round, flattened papillae. These papillae were formed by submucous derma, and this tissue was independent of that of the tumor itself, which was completely separated from the sac by a fibrous spur. However, behind the point of the spur the neoplasm had invaded the posterior wall of the sac. Complete union existed between this tissue and the submucosal neoplasm of the sac. The derma of the mucosa was composed of very thin areolar connective tissue, containing round or oval cells with large nuclei. A few cells were polygonal in shape and of epithelioid aspect.

Epithelium: At the top of the papillae the epithelium had lost its cylindric cells, retaining the polygonal ones with large nuclei. In some places there was no clear line of demarcation between the epithelium and the tumor cells. The epi-

thelium took the shape of a spur between the papillae, and its cells appeared to be larger. Epithelial cells penetrated into the tissue without a line of demarcation and without losing the large nuclei.

The extrasaccular portion of the tumor was divided by connective tissue into round eyelets; the cells were variable in form—sometimes round, and at other times elongated. Some rare ones of epithelioid appearance were oval and polygonal, with deeply stained nuclei and abundant protoplasm.

Due to the obvious infiltration of the derma of the mucosa by epithelial cells, a diagnosis was made of malignant tumor of the mucosa of the sac of epithelial nature, atypical in form, with concomitant inflammatory phenomena.

Case 2.

Latent primary carcinoma of the sac with a sarcomatous polyp. Removal *en bloc*.

The patient was a woman, aged 61 years, who gave a history of a blow on the nose a few months previously, followed by swelling of the internal angle of the right eye. Epiphora with purulent discharge developed.

Examination revealed a soft tumor the size of a hazelnut. Operation: Removal *en bloc*.

Pathologic Examination.—The wall of the sac was thick, the external portion being composed of hyperplastic connective tissue with occasional groups of round cells. The mucosa in general was flat at the top of the papillae. The epithelium was cylindric and stratified, and its cells were extremely elongated. Bottle-shaped unstained spaces appeared here and there. The mushroomlike tumors had no mucous covering. The submucous tissue was epithelialized by embryonic cells:

The tumor itself was composed of connective tissue with fibers arranged in the form of a trellis. Deep down in this

tissue were numerous vessels filled with red globules, some with double and others with single endothelial walls. The vessels increased in number toward the surface of the growth. Also deep in the connective tissue were found cells in karyokinesis, embryonic cells with large, highly colored nuclei, and cells with clear, elongated nuclei as well as double nucleoli resembling sarcoma cells.

Below the mucosa the areolar connective tissue merged into tissue composed of round alveoli also with large nuclei, and little protoplasm. At times the cells underwent a change in shape, becoming elongated, fusiform, with clear nuclei. These were true sarcoma cells. Some nuclei were much larger than others and contained large nucleoli.

Diagnosis.—Sarcomatous polyp of the lacrimal sac.

Case 3.

Secondary carcinoma of the lacrimal sac (alveolar melanotic sarcoma of cho-

roidal origin). Removal *en bloc*.

The patient, a woman, aged 57 years, had been struck in the right eye by a cow's horn 20 years previously, and two years before had received a blow in the same eye. Later, a tumor appeared. Removal of the tumor, and later enucleation of the eye, revealed a melanosisarcoma of the choroid.

Pathologic examination.—After fixation in formalin and inclusion in paraffin, the sac was divided into two parts by transverse section. The cells were sometimes fusiform, and at other times round, with large, vividly colored nuclei. Less pigmented melanotic cells without visible nuclei appeared throughout, closely resembling the cells of the choroid. These cells were sometimes star shaped. Here and there round sarcoma cells were seen, with large nuclei having no coloration.

Diagnosis.—Alveolar melanotic sarcoma of the lacrimal sac of choroidal origin.

450 Sutter Building.

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TUBERCULOSIS OF THE CONJUNCTIVA*

REPORT OF A CASE

WALTEN H. MCKENZIE, M.D.

Saint Louis

The clinical types of tuberculosis of the conjunctiva that are recognized today are best grouped according to Sattler's classification as shown by Bordley¹ and again by Eyre.² These are, briefly, as follows.

Group I. Miliary grayish ulcerations of the conjunctiva which may coalesce.

Group II. Grayish nodules in the conjunctiva resembling trachoma follicles.

Group III. Massive reddish-colored proliferations of the conjunctiva, resembling a cockscomb.

Group IV. Lupus of the conjunctiva, characterized by a uniformly thickened conjunctiva, grayish-covered ulcers, and a tendency to cockscomb formations.

Group V.**. Pedunculated tumors of the conjunctiva resembling papillomata, fibromata, or polyps.

Groups I, III, and IV occur most frequently. Group III is represented as being seen twice as often as either I or IV. The other two groups, II, and V, are rarely observed. Lesions due to endogenous or secondary origin are unusual, according to Eyre.² Schieck,³ on the other hand, wrote that by far the majority of cases of conjunctival tuberculosis were secondary in origin.

Dr. John Eyre, in his Hunterian Lecture delivered before the Royal College of Surgeons of England, in 1912, held that the type of tuberculous conjunctival lesion is dependent on both the number and virulence of the organism introduced into the tissues and on the varying susceptibility of the individual. Groups I and III

represent the infection of a nonresistant individual with a number of virulent organisms, while groups II and V include resistant individuals infected with attenuated organisms.

Frequency. Tuberculosis of the conjunctiva is rarely seen in this country. Bordley, in 1902, reported that out of 41,730 treated eye cases in the Baltimore Eye, Ear, Nose, and Throat Charity Hospital, not one case had been reported. The records at Washington University Eye Clinic did not disclose a single previously diagnosed case. Isolated cases in this country have, however, been reported by Henderson,⁴ Thompson,⁵ Hansell,^{6, 7} Peter,⁸ Jackson,⁹ Shoemaker,¹⁰ Cohen,¹¹ Coover,¹² and others. In Europe where the disease is uncommon, though not so rare as in the United States, Mooren in 100,000 treated eye patients failed to recognize a single case. Samuelson¹³ working in the ophthalmologic clinic at the Seraphimer Hospital reported that during the period from 1915 to 1934 there were only seven cases of tuberculosis of the conjunctiva in a total of 181,000 patients, making, a frequency of almost 1:26,000. Three of the seven cases were considered of primary origin. He estimated that primary tuberculosis of the conjunctiva therefore occurred there in a ratio of 1:60,000. In 1936, he reported three cases that he had seen in the previous 12 months, all of which he considered as primary in origin. Eyre gives the frequency of other writers (Hirschberg, 1:17,000; Horner, 1:4,000; Milligan, 1:20,000; Mules, 1:33,000; Spangenberg, 1:17,000; Remlinger, 1:1,900; Bock, 1:10,000; Lagrange and Cabannes,

1:7,500; Stephenson, 1:1,500; Pegorora, 1:13,500; Saemisch, 1:1,660; Gourfein, 1:1,600; Casali, 1:300; and Guy's Hospital Record, 1:3,200) between 1881 and 1912.

Age and sex incidence. Most workers stated that the disease was seen most frequently during the first 20 years of life. In Samuelson's¹³ cases 66 percent, in Eyre's 67 percent, and in H. Villard's¹⁴ 72 percent were found to be 20 years old or younger. The former two workers reported that women were afflicted twice as frequently as men. Prior to 1905, only one case had been reported in the Negro race (Villard¹⁴).

Location. The tuberculous lesions are found most often in the palpebral conjunctiva (70 percent), in the bulbar conjunctiva (22 percent), and in the fornix (8 percent), according to Villard. It has been noted that these lesions are encountered most commonly in the upper eyelid where foreign bodies are prone to lodge.

Eyre pointed out that prior to laws to control tuberculosis in cattle, the bovine bacillus was given credit of causing 20 percent of all the conjunctival lesions. In Copenhagen at the Finsen Institute, 4 patients out of 40 were considered as being infected by the bovine organism.

The preauricular and regional lymph glands were almost always infected. Such lymph-gland involvement was found in 27 of Eyre's 29 cases, in each of the three cases reported by Samuelson in 1936, and in 85 percent of Villard's proved cases. Samuelson strongly believed that the regional lymph nodes are always infected in the primary and never in the endogenous cases.

Symptoms. The complaints of an individual with conjunctival tuberculosis are usually trivial and misleading. These patients, as a rule, seek medical advice because of an itching eye, a swollen or droopy eyelid, mild lacrimation, persistent

photophobia, or a preauricular swelling, as the first symptom observed. Pain is conspicuously absent and is present only as a result of secondary infection with associated ulceration and swelling, or as a result of corneal involvement. The latter is rarely present and then only late in the disease. Valude¹⁵ held that the organism was unable to penetrate the intact corneal epithelium.

Differential diagnosis. The differential clinical diagnosis is frequently very difficult and must be made from granulomatous trachoma, lues, vernal catarrh, Parinaud's conjunctivitis, and epithelioma. The diagnosis is certain only through guinea-pig inoculation, or the discovery of the organism in specially stained smears of the secretion or in tissue-section.

A biopsy is important. The presence of the specific cytologic changes of tuberculosis in the excised tissue is sufficient to justify a diagnosis.

In the cases reported in the literature, the tubercle bacillus was found in only 25 percent on examination of the secretion or excised tissue (Samuelson¹³).

The tuberculin test, though unreliable, was present in 99 percent of the patients with tuberculosis of the conjunctiva.

Microscopic appearance. The microscopic findings of tuberculosis of the conjunctiva as reviewed by Löhlein¹⁶ showed in the conjunctival lesions of group I, through biopsy, typical miliary tubercles with central caseation in a granulation tissue rich in cells and tubercle bacilli. In group II, tubercles of epithelioid and giant cells were observed, having little caseation, few bacilli, and mild lymphoid infiltration of the vicinity. Prepared sections from the conjunctival processes of group III showed a granulation tissue with small round cells and fewer specific cells of tuberculosis than in the first two groups. Tubercle bacilli were present in scanty numbers. In group IV, the con-

junctiva affected with lupus was characterized by an extension of the process over the surface with the formation of smooth, contracting cicatrices in the conjunctiva and little tendency to caseation. The tuberculous process in group V differed in being composed of connective tissue enclosing epithelioid and giant cells and was only slightly prone to ulcerate or show caseation.

REPORT OF A CASE

On July 30, 1937, J.R., an 18-year-old colored girl, was referred to the Washington University Eye Clinic by an ophthalmologist because of a "sore" on her right eyelid which had failed to respond to treatment. The patient stated that approximately one year previously she had picked a "lump" on the right upper eyelid with her fingernail. Subsequently, the lid became red, swollen, and painful. Later history revealed that at this time the patient was in rather close contact with persons believed cured of pulmonary tuberculosis. The lid lesion grew progressively worse in spite of prolonged treatment. The general health had been good. The patient denied any injury or infection of eyes prior to the present disease. The family history revealed nothing of significance.

Examination. Vision, O.D. was 6/15 —1 without glasses, O.S. 6/12 —2 without glasses; after determination of the refractive error, which was correctable with O.D. —1.00 D.sph., O.S. +75 D. cyl, ax. 140°, it was 6/12 in each eye. There was much irregular lenticular astigmatism in each eye which would not yield to correction.

The right upper eyelid drooped, was thickened and swollen (fig. 1), particularly in its outer one third, where it was pushed away from the eyeball. The lashes were very sparse for a distance of 3 mm. adjoining the outer canthus. There was present some excoriation of the skin in this region. The adjoining palpebral con-

junctiva was thickened, red, and studded with raised granulomatous papules about 1.5 mm. in diameter.

The right lower eyelid was involved in a similar manner but here the process was much more extensive and pronounced, extending approximately 16 mm. from the temporal canthus. In this area the lashes



Fig. 1 (McKenzie). Showing the appearance of the eyelids when the diagnosis was first made and before X-ray therapy. Note the lower lid, the loss of the eye lashes, the mottled appearance of the skin, and the tuberculous papule.

were absent (fig. 1) and the skin was grayish white and mottled for 3 to 4 mm. below the lid margin. The latter presented a pale grayish moth-eaten appearance. The underlying conjunctiva presented alternating deep-red and light grayish-pink areas which apparently had broken down, being very soft to palpation. The lower palpebral conjunctiva and lid margin were covered by a mucopurulent secretion which tended to cause the eyelids to adhere near the temporal canthus.

The lacrimal apparatus, the bulbar conjunctiva, and the sclera appeared normal. The pupil was round, regular, and active to light and accommodation. The cornea was clear, as were the remaining media. The keratometer showed minimal corneal astigmatism; retinoscopy, marked irregular lenticular astigmatism. The fundus presented no changes from the normal. The left eye and eyelids showed no pathologic changes other than the lenticular

astigmatism, as was observed in the right eye. The external ocular movements of both eyes were intact; a mild horizontal nystagmus was present and believed to be congenital. The tension was normal in both eyes.

such with hot saline compresses and the usual ocular antiseptics. The edema and inflammation partly subsided, but since progress was not satisfactory and the tuberculin test had been so markedly positive, a biopsy was performed. At the



Fig. 2 (McKenzie). Section through tuberculous tissue under lid margin to the left and under palpebral conjunctiva to the right. Light-colored areas are groups of epithelioid cells. $\times 40$.

Fig. 3 (McKenzie). Section through tuberculous tissue of eyelid showing two giant cells immediately surrounded by epithelioid cells and in the periphery small lymphocytes and plasma cells. $\times 340$.

The general physical examination, together with Kahn* test, urinalysis, blood counts, and chest X-ray studies, was negative. The tuberculin test was markedly positive. The preauricular and cervical lymph glands were not involved.**

The case was first diagnosed as an ulceration of the eyelid and treated as

same time tissue was excised for guinea-pig inoculation.

Pathology. The histologic findings in the case of two biopsies were reported by Dr. Harvey D. Lamb: A biopsy removed from the thickened conjunctiva of the right lower eyelid on August 28, 1937, showed papillary hypertrophy and dense infiltration with small lymphocytes and plasma cells. In a few places within the infiltrated tissue, occurred small nodules of epithelioid cells with an occasional giant cell. Numerous fibroblasts, indicating incipient cicatrization, were observed.

*The Kahn test was negative when first taken in August, 1937; however, when repeated in March, 1938, it was found to be 4+. Antituberculous treatment was instituted.

**There was no lymph-gland involvement until August, 1938, when a gland below the angle of the right jaw became acutely inflamed.

On September 27, 1937, a biopsy was taken across the margin of the right lower eyelid at its most affected part. Sections from this specimen (fig. 2) showed the epidermis of the skin and lid margin to



Fig. 4 (McKenzie). Showing the appearance of the eyelids five weeks after the institution of X-ray therapy. The papule had almost disappeared and the skin was assuming a more normal appearance.

present numerous thick and long downgrowths and many additional layers of flattened cells with a thick stratum of keratinization. The epidermis was mildly infiltrated with scattered pus cells. The covering epithelium of the inner-lying conjunctiva was generally a little thickened, with an occasional broad and short downgrowth. The underlying tissue was characterized by dense infiltration with small lymphocytes and plasma cells, enclosing numerous islands of large and small size, composed of epithelioid cells and many giant cells (fig. 3). Toward the skin side of the specimen occurred large groups of fibroblasts in the densely infiltrated tissue.

Conclusions. The cytology of the excised specimen was typically that of tuberculosis of the conjunctiva and lid margin

Treatment. The conjunctival and skin lesions continued to spread under symptomatic and general treatment. Surgical removal and cauterization were discarded temporarily because of the positive resulting mutilating effects. X-ray treatment was advised and given by Dr. Sherwood Moore. Within one month after X-ray therapy had been instituted, the hypertrophied papules had disappeared, the skin and conjunctiva (though scarred) were assuming a fairly normal appearance (fig. 4). However, the upper eyelid suffered a flare-up of activity in February, 1938, while the lower lid remained quiet. Further X-ray treatments were given and greater efforts made to improve the patient's general health with increased dosages of cod liver oil, rest, sunshine, plus the drinking of milk and fruit juices. Progress was good until August, 1938, when a small papule developed on the approximating lid margins of the upper and lower eyelids at the junction of the outer two thirds with the inner one third. At the same time a lymph gland at the angle of the right jaw became acutely inflamed and tender to palpation. X-ray treatments were again resorted to for treatment of both regions and the process



Fig. 5 (McKenzie). The eyelids as they appeared on October 14, 1938, approximately one year after beginning X-ray therapy.

appears to be abating (fig. 5). Recent medical check-up has failed to locate any lesions elsewhere.

Prognosis as to life is, of course, poor. The patient was advised to continue pres-

ent treatment and to return weekly for observation.

ation to Dr. Harvey D. Lamb for his cooperation in preparing this report and for the excellent photomicrographs.

The author wishes to express appreci-

the excellent photomicrographs.

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RADIUM IN THE TREATMENT OF CHALAZION

GEORGIANA DVORAK-THEOBALD

Oak Park, Illinois

AND

CLEVELAND J. WHITE

Chicago

The application of irradiation to the treatment of infections and inflammatory conditions dates from shortly after the discovery of the roentgen rays. But, although proved to be of very great benefit and almost specific in a number of such conditions, its use by the general profession in inflammations of an infectious origin has been very limited, due partly to failure of practitioners fully to appreciate the benefits, partly to the failure of radiotherapists to develop precise techniques for certain definite local lesions, and partly to lack of complete coöperation between practitioner and radiologist. This applies to the use of both roentgen rays and radium.

Irradiation treatment of tumors, especially malignant tumors, has been greatly developed and extensively applied. We must, however, keep in mind that the objective aimed at in irradiation therapy of inflammatory conditions is quite different from that in the treatment of a tumor or malignant condition. In the latter the aim must be to deliver the largest possible dose to every part of the tumor compatible with preservation of the integrity of the overlying and surrounding tissues. Massive dosage is the rule. In inflammatory conditions the beneficial effects of irradiation, as stated by Hodges and Berger, are not due to any

metabolic changes in the cells. In inflammations the object of irradiation is not to destroy tissues. In a recent lecture Richard A. Jaffé said, "Weak doses of irradiation seem to stimulate the reticulo-endothelial cells; several authors, among them W. Soper (*Zeit. f. exper. Path. u. Therap.*, 1917, v. 16, p. 467) have stated that radiation intensifies vital staining, which may be considered as the morphological expression of an increased functional activity."

On the part of practitioners, misconceptions have arisen from attributing the effects of massive dosage on tissues as also desirable in the case of the small dosage used in the treatment of inflammations. The occasional secondary effects of irradiation of malignant or deep-seated tumors cannot perhaps be avoided; but this does not apply to superficial infections treated by very moderate irradiation therapy. The doses employed for obtaining the subsidence of inflammations are less than the erythema dose and the risk of injury to healthy tissues is minimized; there is no need to use massive doses and, indeed, as Desjardins remarks, the risk of complicating the inflammation already existing by inducing an inflammatory reaction to an excessive dose of rays, may spread rather than resolve the primary inflammation.

While the primary object of this paper is to point out the advantage of radium in the treatment of chalazion, it will not be amiss to refer briefly to some of the applications of radium therapy to other ocular lesions.

RADIUM IN OPHTHALMOLOGY

The application of radium therapy in ocular pathologic conditions, both benign and malignant, is governed by the same general rules as its application elsewhere. As Ward pertinently remarks, the proper appreciation of the radiosensitivity of the various parts of the eye has a most important bearing on the value of this therapy. Radium gives off three kinds of energy: the alpha, beta, and the gamma rays, which produce a caustic effect, tissue changes, and growth restriction. According to Clement, radioresistant growths have a definite plan of growth—marked production of fibrous tissue, scant but well-defined blood supply, and a compact cell of adult type with low metabolism. The radiosensitive growth has a loose cell structure, delicate blood supply, paucity of fibrous tissue, and no definite plan of growth. The penetrating gamma ray, according to Brown and other writers, is more suitable for deep-seated lesions and the softer beta rays for superficial lesions. These beta rays, applied at short intervals for short periods, seem to be effective in the treatment of inflammations and when properly applied are relatively harmless to tissues. It is rather a matter of radiologic technique to exclude undesired emanations by proper screening and filtration. The ideal to be aimed at in ocular radium therapy is the correct appreciation of the difference in sensitivity between diseased and normal tissues; when this is reached the diseased tissue is destroyed and the surrounding tissue but little affected.

LITERATURE

Ward states that of the ocular structures the conjunctiva and lids are the most susceptible to radium emanation, the globe, excepting the lens, being comparatively radioresistant. Among the benign lid lesions very susceptible to radium

are nevi and papillomas. Epithelioma of the lids often yields to radium therapy. Creeves states that he had two cases of lid epithelioma which disappeared like magic under radium treatment, and Hubin, of Weeker's Ophthalmic Clinic, in the University of Liège, states that epithelioma of the lids has been treated there by radium regularly since 1925, and that between 1925 and 1931, 36 cases had been completely cured, with results superior to those from any other form of treatment.

There are several reports in the literature concerning the radium treatment of intraocular tumors, but in this paper our interest lies elsewhere.

With regard to irradiation therapy of ocular inflammations, Desjardins, of the Mayo Clinic, states that certain inflammatory conditions of the eye can be treated effectively with radium or with roentgen rays.

As previously stated, in this paper we desire particularly to deal with the radium treatment of chalazion.

The term chalazion is often loosely applied to any swelling, whether inflammatory or not, either in a meibomian gland or its duct, and Knapp states that under the diagnosis of chalazion, tumors of the eyelid are operated upon which are not chalazia but often epitheliomas. The chalazion is a benign growth.

True chalazia may be divided into three groups: those in which the center is liquid and the walls well defined. This type usually yields readily to surgical opening and curetting. In the second group the center is partially liquid but there is also soft granulation tissue. Chalazia of this kind are often spoken of as retention cysts, but they cannot be classed as cysts because the contents are not the product of glandular activity, as in the case of a true cyst, but are the result of necrotic changes. Moreover, the wall of a chala-

zion is not a true capsule possessing an epithelial lining, but is formed by a condensation of the connective tissue in juxtaposition with the growth.

The third type of chalazion is composed of firm granulation tissue, and the surrounding lid is thick and boggy. Histologic examination shows that in this type the granulations extend into the surrounding tissues without a definite confining connective-tissue boundary. Even careful surgery may not be successful in reaching all the granulations, and the tumefaction may recur.

In a review of the pathogenesis and pathologic anatomy of chalazion, published in November, 1935, one of us (G. D.-T.) reached the conclusion that, despite the very large amount of histologic investigation of this little tumor of the lid, there was still indecision as to its exact nature. The now clearly established chalazion may be defined as a circumscribed elevated mass of inflammatory granulomatous tissue, generally containing giant cells, situated in the tarsus, resulting from a chronic inflammatory process. It is properly a granuloma, the term being justified by the histologic elements usually constituting the growth. The present accepted view is that it originates from a low-grade infection involving a meibomian gland with blocking of its excretory duct. There are, however, other theories which need not be discussed here.

No matter what may be the nature of pathogenesis of chalazia, their histologic structure shows that these growths are particularly radiosensitive; they fulfill the criteria of Clement, already mentioned, in that they are of loose cell structure, with delicate blood supply, scant fibrous tissue,

ally regresses and disappears within a few weeks, leaving only a small, soft, pliable scar. The biologic action of irradiation on the inflammatory process has already been discussed.

In the general literature we find no mention of the radium treatment of chalazia. Hodges and Berger state that granuloma in general responds favorably to irradiation. Brown, who reported on 258 ocular lesions covering 35 different diseases treated by radium, does not mention chalazion.

The cystic types of chalazion usually are amenable to surgical curetting; in the type of chalazion composed of firm granulation tissue in a thick boggy lid, radium therapy is particularly useful and effective. We have had experience with several cases of this kind in which radium therapy yielded very satisfactory results. The following case is typical.

CASE REPORT

Miss M., aged 44 years, came to my (G. D.-T.) office, June, 1934, with the history of recurring chalazion in her left lower lid. The nasal side of the lid was very thick; on everting it, a large granulating mass was seen just posterior to the lacrimal duct. The mass had been opened and curetted twice previously and, on account of its position, I hesitated to proceed with radical surgery, fearing a deformity of the lacrimal apparatus.

Under local anesthesia I removed most of the granulation tissue and referred the patient to Dr. Cleveland White for radium treatment.

Following the excellent result obtained in this case, all other cases of chalazion, suitable for radium treatment, that came to my observation were referred to Dr. White. The treatment was tried at first on recurring chalazia only, but later, on all chalazia of the granulation type, even those incised and curetted for the first

time. In three cases the chalazia were treated by radium without a preliminary curetting. In all cases the patients when first seen showed an inflammatory reaction, a thickened boggy condition of the tissues around the chalazion which suggested a sluggish rather than an acute inflammation. In all cases the chalazion itself was composed of gelatinous granulation tissue.

Altogether 28 patients have been treated. In all except the three that did not have a preliminary incision and curetting, the results were excellent and no recurrences have been observed.

Dr. White's report is as follows:

"The radium treatment of chalazion was suggested by Dr. Theobald. All the patients when first seen had the characteristic chalazion nodule complicated by inflammatory swelling and boggy thickening of the tissues surrounding the lesion.

"The pathology and ophthalmologic handling has been discussed by Dr. Theobald.

"As there were no known criteria on which to base radium treatment, it was carried out along empirical lines at first. Eventually the following technique was worked out: The chalazion was well isolated and lead screens placed around it. A 10-mg. plaque of radium was used, filtered by one-tenth millimeter of aluminum. Four treatments of 18 minutes each were administered, and the treatments were given twice a week.

"Twenty-eight patients were treated, and of this number 23 showed marked response after the third treatment. Two failed to take more than two treatments. Of those that completed the course three apparently did not get what might be called an excellent result. These three patients had had no curetting preceding the radium treatment.

"It is felt that with increasing experi-

ence larger doses of radium may be given. Possibly it would be well to use more filtration with the increasingly larger doses. The results are more spectacular where there is marked inflammatory swelling of the surrounding tissues."

DISCUSSION

We have reported these cases because, although in the majority of chalazia, surgical treatment is practical and effective, yet there are others in which surgery is difficult or leaves an unsightly scar. Moreover, in cases of recurring chalazion of the granulation type, ordinary methods fail often to prevent recurrences, as in the aforementioned case. For all such eventualities radium therapy is suggested.

It may be objected that radium treatment of chalazion exposes the patient to serious risks, especially that of radium cataract. In the literature, there are reports by Blegvad, Gualdi, de Schweinitz, Merkulov, Moore, and others of cataract appearing within two years following the application of radium in the treatment of ocular lesions. It should be pointed out, however, that in almost all cases cataract followed radiotherapy of deep intraorbital tumors or superficial malignant tumors in which massive dosage was employed. In the case of superficial benign ocular growths, such as chalazion, only light dosage, less than erythema dosage, is sufficient, and proper screens and filters amply protect the lens and globe from any possible damage. The worst that may be anticipated in the radium treatment of chalazion by a competent radiotherapist is a conjunctivitis of a temporary nature.

Blegvad mentions a possible slight complication from irradiation about the lids not previously described. This consists of an overlapping of the skin over the mucosal lid margin or vice versa. Blegvad explains this by a difference in the

radiosensitivity of the epidermis and mucous membrane; the epidermis, being less sensitive, heals faster and extends over the slower healing mucous membrane. Such a complication was not observed in any of our cases.

SUMMARY

The application of irradiation therapy

to infections and inflammations generally is discussed.

The value of radium in the treatment of granulomatous chalazia is pointed out and illustrated by case reports.

The application of the radium is described.

715 Lake Street.

122 South Michigan Avenue.

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the etiology of this condition. As previously noted, there was for a time considerable doubt as to whether the iris atrophy or the increased intraocular tension was the primary lesion, but numerous cases have now been reported in which the atrophy of the iris was observed for varying periods of time before the onset of glaucoma. De Schweinitz⁷ watched his patient for two years before increased tension was noted. Rochat and Mulder,⁸ in their case, observed no signs of intraocular tension until the second examination, which took place seven years after the first observation. McKeown² has followed his case for four years without finding symptoms of glaucoma, the tension and the vision both remaining normal up to the present time. Waite⁹ felt that intraocular hypertension supervened as a direct result of the reaction in the capillary bed, due to the atrophy of the iris. Feingold⁵ and Lane¹⁰ felt that a disturbance of circulation was the primary etiological factor. The former writer considered this to be congenital, the latter that it followed arteriosclerotic changes. Zentmayer¹¹ suggested malnutrition from vascular sclerosis, and de Schweinitz was of the opinion that some constitutional or focal infection might have resulted in disease of the vessels of the iris, thereby lowering nutrition and resulting in atrophy. Kreiker¹² suggests that possibly cytolytic processes which normally resorb the pupillary membrane during intrauterine life may become reactivated to the point of resorption of the normal iris tissues. This theory seems hardly tenable, owing to the rather advanced age of onset in a few of the cases. Deposits on Descemet's membrane, indicating a preceding iridocyclitis, were reported by Hess¹³ and Harms,¹⁴ two of the earliest writers on this subject. Such a finding would, however, according to the accepted definition, rule their cases

out as true examples of essential atrophy of the iris and need not, therefore, be considered. In a few cases, antecedent injury has been noted, but hardly in sufficiently close relation to the initiation of the disease as to warrant considering it to be an etiological factor.

The onset has usually been in early adult life, though the youngest patient, that of Fine and Barkan,¹ was only five years old, and that of Griscom,¹⁵ 54 years of age. Females have been affected twice as often as males, according to Fine and Barkan. The affection is, for the most part, unilateral. Only two or three bilateral cases have been reported. The general condition, as a rule, has been good. Luetic infection has apparently played no part.

CASE REPORT

Miss M. K. O., 35 years of age, was first examined on January 21, 1913, by Dr. M. Hayward Post, Sr. Since then, her case has been followed at frequent intervals up to the present time. The chief complaint, which had led her to seek advice, was headache, accompanied by blurring and drawing of the eyes after close work. Glasses had been prescribed by an optician six years previously, and changed four times during the interval, the last occasion being about one year before the date of the first examination. The vision, without correction, was then found to be, right eye 20/30, left, 20/15. Glasses were prescribed as follows: O.D. — 1.00 D. cyl. axis 180°; O.S. — 0.75 D. sph. \approx — 0.50 D. cyl. axis 90°. With them, the vision in the right eye was increased to 20/24, that in the left remaining as before.

It was noted that the right pupil was pear-shaped, with its narrow, elongated portion reaching almost to the limbus at the upper pole in the vertical meridian. In the upper temporal quadrant there was a complete perforation through the

root of the iris, roughly circular in shape, 2 mm. in diameter. There were several small perforations, and a general ragged condition of the iris stroma near the limbus at the lower pole, opposite the elongation noted above. The lower border of the pupil was, however, not displaced upward, nor was there any special pull on the fibers of the iris below (fig. 1). The tension in the right eye, as measured by the Schiötz tonometer, was 45 mm. Hg. No definite ophthalmoscopic findings were recorded at that time, but it was stated that after dilation of the pupils no cause for atrophy of the iris could be discovered. This statement, in accordance with the usual custom of the elder Dr. Post, was equivalent to a negative report as to the presence of demonstrable pathologic condition of the lens, fundus, or optic disc. The wording of this report would also exclude the presence of iridocyclitis, no symptoms of which have ever been demonstrated up to the present time. A chronic conjunctivitis was noted, and treatment with zinc sulphate and zinc oxide was instituted for that condition. Pilocarpine was also prescribed shortly afterward.

The tonometer readings continued to be elevated, and pain and discomfort were complained of at times. These latter symptoms were often of a sharp, shooting character and were greatly increased following close work. Fields for form, taken on April 15th, showed that of the right eye reduced to about one half the normal size, that of the left eye normal. By June 10th, tension was reduced to 40 mm. Hg, but pain continued as before. Pilocarpine was discontinued at this time and potassium iodide was substituted. A year later, on April 11, 1914, the pain had again recurred, and the tension was up around 50 mm. Hg. The field had shrunk to within the 10-degree limit, being especially contracted above. Eserine was

used, and pilocarpine was again prescribed. The tension, nevertheless, continued high, and the pain was unrelieved, so that operation was recommended and was performed about May 1st, by Colonel R. H. Elliot during his visit to Saint Louis. The procedure selected was a typical Elliot trephining.

Despite a good edematous flap, and frequent instillations of eserine, the tension

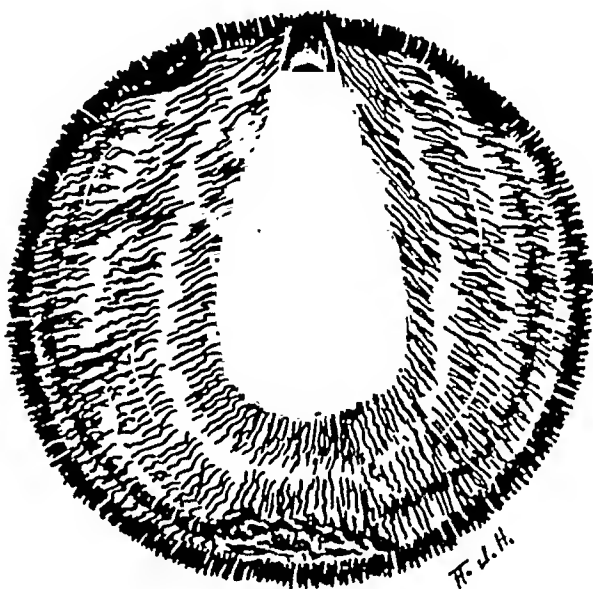


Fig. 1 (M. H. Post). Appearance of iris and pupil at first examination, January 21, 1913.

was little affected. On May 28th, the tension was 37 mm. Hg, and the vision was reduced to 20/120. The systolic blood pressure recorded at this time was 110 mm. Hg. During the next few months, the eye exhibited rapid fluctuations of tension. At one moment it would be somewhat soft, and an hour or so later the tension would rise to such an extent as to cause the cornea to become steamy. On November 27th, therefore, the eye was again trephined, a 2-mm. trephine being used. Following this operation, the tension remained normal, but the vision continued to fail. On February 2, 1915, it was reported as the ability to see hand movements at one foot. The optic disc was grayish white, sharply defined, and

showed four diopters of excavation. The vision in the left eye was noted as 20/12, without correction.

Since then, little change has taken place. On June 20, 1923, the cartilaginous septum of the nose was removed, and the sphenoid and ethmoid on the left side were opened. By April 17, 1934, the vision had fallen to zero. The tension, taken at that time, was O.D. 16 mm. Hg, O.S. 16 mm. Hg (Schiötz).

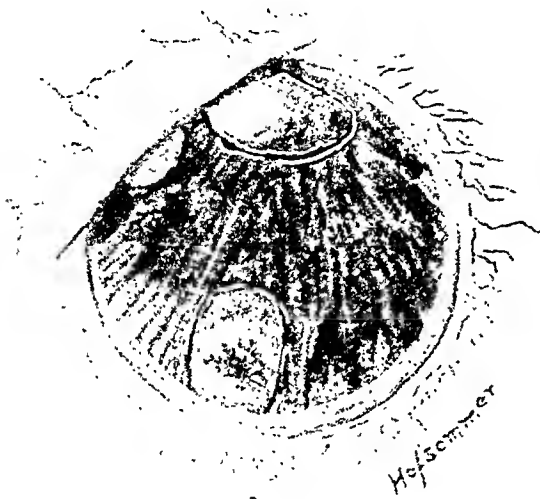


Fig. 2 (M. H. Post). Showing progressive iris atrophy. Appearance of iris and pupil in 1938.

This condition had not changed when last seen. Ophthalmoscopic examination gave only a good red reflex. The lens showed a moderate degree of nuclear and cortical cataract, sufficient, however, to prevent any view of the fundus details. It is interesting to note that in the left eye the lens is clear, the fundus and disc are well seen and show no abnormalities. The vessels are free from arteriosclerotic changes.

The iris appears as shown in figure 2. The pupil is drawn upward, so that its lower margin does not extend below the upper one fourth of the entire diameter of the cornea. Nor does it quite reach the limbus above. The upper nasal portion

is covered by a heavy fold of conjunctiva which was brought down to cover the trephine opening. The pupil is somewhat elongated in the horizontal meridian, measuring about 6 mm. by 3 mm. There is marked ectropion uveae surrounding the entire opening. About the center of the conjunctival fold there is a rather well-marked and circumscribed bleb of conjunctiva. Below this bleb and somewhat to the temporal side, lying below the pupil and about one half its size, is an almost circular dialysis of the iris with some ectropion uveae, not so marked, however, as that about the pupil itself. At the lower pole, extending well out to the limbus, a third break through all the layers of the iris is present. This opening is about the same size as the pupil, but having its greatest diameter in the vertical meridian. Marked ectropion uveae is present. In addition, there is a delicate, brownish pigment deposit on the anterior lens capsule, somewhat accentuated by the slightly grayish appearance of the lens. A fourth rather small dialysis, extending through the entire iris tissue, can be seen above the temporal portion of the pupil. The stroma is greatly attenuated throughout and shows marked atrophy. In many places, the pigment layer of the iris is seen, the color being of a rather greenish cast. Many of the fibers have been drawn out from their lower ciliary attachment to at least twice their normal length.

Gonioscopic examination did not show the brown band of the ciliary body. The canal of Schlemm could not be made out. Below, to the temporal side, a few fibers of the iris stroma were adherent to the endothelial surface of the cornea. A similar adhesion was seen above and to the nasal side. Neither the dialysis below nor that to the nasal side extends completely out to the root of the iris. The ciliary processes cannot be seen at either place.

CONCLUSIONS

This case is of interest because of the long period over which it has been observed, rather than for any particular additional information that it gives as to the etiology of this condition. The recorded data are insufficient to determine whether or not arteriosclerotic changes preceded the iridodialysis. It would appear that stretching of the iris tissues played little part in the etiology, as these

were not seen to be under tension when first observed. The only evidence of any inflammatory process having existed at any time was the presence of a few pigmented spots on the anterior capsule of the lens, seen through the dialysis in the iris below. These might possibly be interpreted to indicate a very low-grade inflammation involving the pigment layer of the iris at this point.

524 Metropolitan Building.

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CONGENITAL PREPAPILLARY CYST CONTAINING A MOVING VASCULAR LOOP

JESSE M. LEVITT, M.D., AND RALPH I. LLOYD, M.D.
Brooklyn, New York

Case report. B. S., aged 15 years, a school girl, came to Dr. Levitt on May 29, 1938, because she had been told by the school physician that there was something wrong with the left eye. Her eyes had never bothered her, nor had she had any serious illness. The visual acuity of each eye was 20/20 and both were outwardly normal in every way. The vision of each eye under homatropine cycloplegia was 20/40 corrected with -0.50 D. sph. to 20/20.

The media and fundi of the right eye were entirely normal. The media of the left eye were clear, but in the fundus was a striking abnormality. A grayish-white circular elevation covered part of the disc (fig. 1) and extended beyond it at the lower inner margin. It was about $2\frac{1}{2}$ to 3 times the disc size and surrounded by normal tissue everywhere. The elevated area was rather sharply demarcated over most of its extent by a light reflex located farther out than the ophthalmoscopic image would suggest it should be. The retinal vessels at the lower part passed in front of it; those at the upper part were veiled and ensheathed in the tissue covering. There were no pigmentary deposits nor was there any other evidence of possible inflammatory or hemorrhagic disturbance. In making an observation with the monocular ophthalmoscope the involved zone appeared elevated above the rest of the fundus. The true nature of the cyst was disclosed only when studied with the Gullstrand binocular ophthalmoscope; its cystlike character

loop moved above beyond the upper limit of the disc and below to the lower disc margin when it descended. The loop remained above (erect image) when the eye was at rest, suggesting that the loop was lighter than the media in which it moved. The upper end of the loop assumed a knobbed appearance, evidently due to its being observed from the front with one arm of the loop placed behind the other. The attachment and origin of the loop could not be seen because of the density of the tissue over the disc at this point.

The blind spot of the left eye was moderately enlarged with sharp limitations, as the illustration shows (fig. 3) and is about what one would expect, assuming that the optic-nerve fibers pass over the cyst in the anterior wall without being damaged. With red-free light, the binocular scope showed the nerve fibers running across the front of the cyst without apparent interruption or evident displacement, which would explain the absence of a wedge-shaped defect with the apex at the blind spot, which might be expected if the defect affected the nerve fibers running over this area on their respective routes to the periphery and intermediate points. The peripheral field of this eye was about ten degrees less than its fellow (fig. 4). This condition was plainly neither an inflammation nor a degeneration. The normal vision, absence of inflammatory deposits and pigment changes, sharp limitation of the defect and its cystlike character, connected with the disc, stamped it a malformation of a type not frequently reported but well understood.

Literature. A very few simple cysts like this have been reported, but the larger cystic dilatation of Cloquet's canal, pro-

jecting into the vitreous have been noted much oftener, and the very large type connected with the disc at the rear and reaching forward almost to the lens, with a dilated cystic anterior and posterior extremity is even more common. None

Liebreich in 1871. According to Ida Mann these are persistent vascular loops in the glial tissue which project from the disc of the embryo with the hyaloid-artery stem as the axis. Usually, the vascular loop, the glial tissue, and the hyaloid

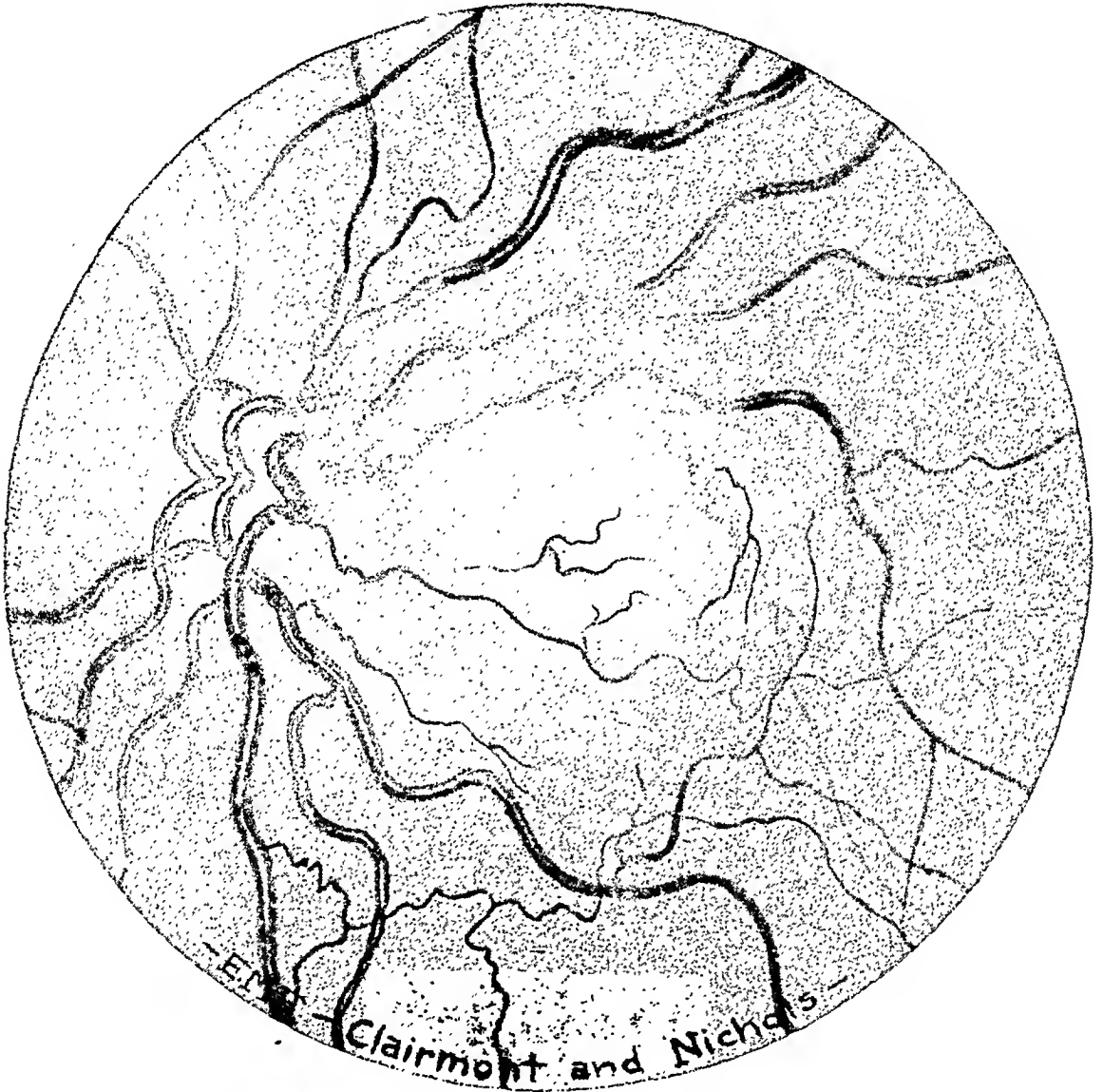


Fig. 1 (Levitt and Lloyd). Congenital prepapillary cyst as seen with hand ophthalmoscope.
Vision = 20/20.

of these occur with the frequency of the hyaloid-artery remnant of modest proportions throughout but easily seen and usually connected with the lens in front and the disc behind. The freely moving loop within the cyst was at first thought bizarre, but it is very similar to the pre-retinal vascular loops described first by

artery all disappear, but if the loop persists and the other two elements disappear, a loop carrying blood may project out into the vitreous (fig. 5). The glial tissue may persist in varying degrees to explain the numerous forms of prepapillary tissue beginning with wisps of delicate tissue often seen on the disc, as

one extreme, and the congenital falciform detachment of the retina as the other, while a large patch of tissue plastered upon the disc, completely obscuring its details, may be considered as an intermediate form.

Reports of cystic formations in the

in, but this is not to be wondered at when it is stated that the loop could not be seen with the hand ophthalmoscope but was discovered and easily studied with the Gullstrand binocular ophthalmoscope. It seems reasonable to say that the loop is similar to those reported as projecting

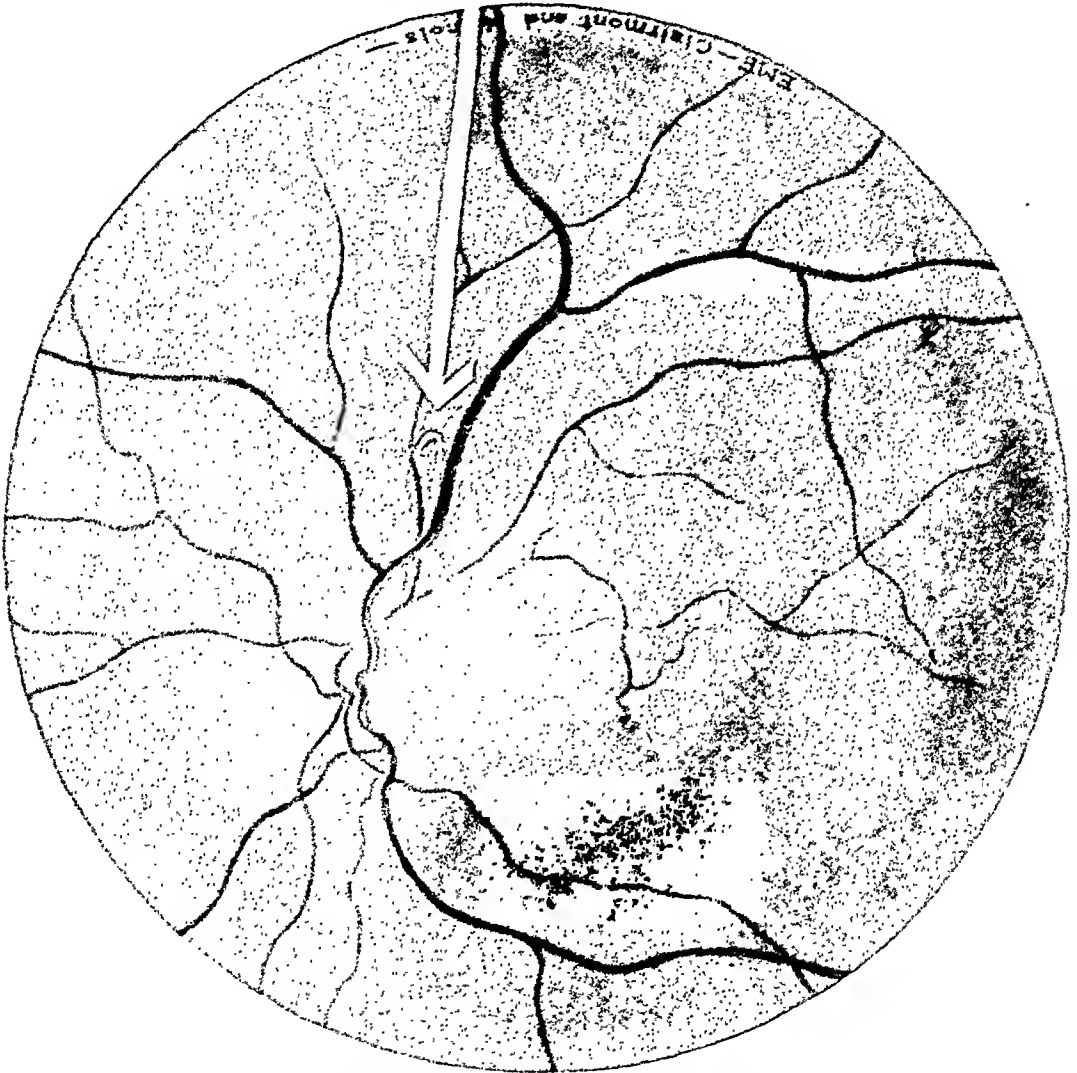


FIG. 2 (Levitt and Lloyd). Congenital prepapillary cyst observed with the Gullstrand binocular ophthalmoscope. The loop floating within the cyst comes to rest at the top and is just beneath the point of the arrow.

glial tissue upon the optic disc are not numerous and none has been studied microscopically so far as we can learn. The flat variety such as the one we are reporting is by far the scarcest of the three varieties mentioned. In none of the reported cases have we been able to find mention of a vascular loop floating with-

into the vitreous and that this one would have done so but for the persisting glial tissue distended by fluid, in front of it.

The illustration shows the embryonic tissue on the fetal disc, and the level to which the physiological atrophy progresses normally (fig. 6) can easily be seen.

The illustration by Miss Freret is very well done but it is impossible to reproduce the stereoscopic effect of binocular ophthalmoscopy. In the drawing, the loop does not assume the relationship to the other elements of the fundus which only the third dimension makes apparent when observed binocularly under high magnifi-

feature was the apparent absence of any space between the retina and the tissue behind it above the upper border of the disc. In the other developmental defects

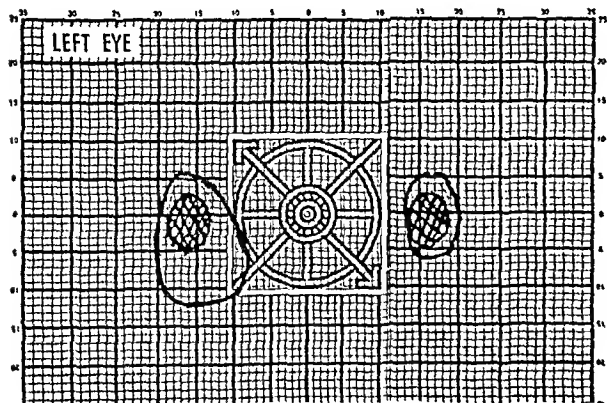


Fig. 3 (Levitt and Lloyd). Left eye. Blind spots mapped, using $\frac{1}{2}^\circ$ white test object.

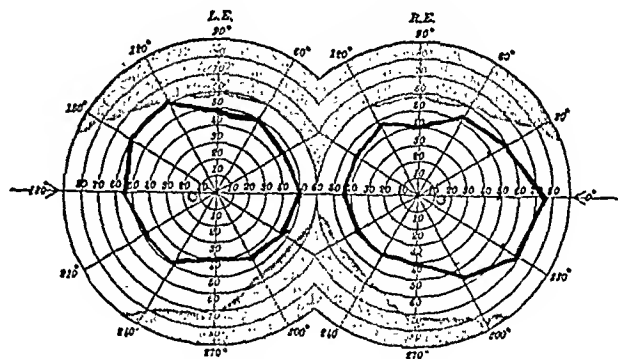


Fig. 4 (Levitt and Lloyd). Fields of vision taken with a 5-mm. white test object.

cation. The movement of the loop was free and extended from the lower edge of the disc up to the position it occupies in the drawing. There might have been some doubt about its position from front to back, if it had been stationary, but the loop was always behind the retinal vessels as it moved, and the only incongruous

like coloboma of the choroid, and the extrapapillary coloboma of Lindsay Johnson, and in pathological conditions like tuberculoma of the choroid, the scotoma resulting is often much wider than the defect seems to justify. The vessels of the retina are intimately associated with the anterior cyst wall and this agrees with the observations of the various types of defects of this group, including the so-called preretinal veils as described by Mann and Weve.

We have been able to find but one of these simple cysts reported in the litera-

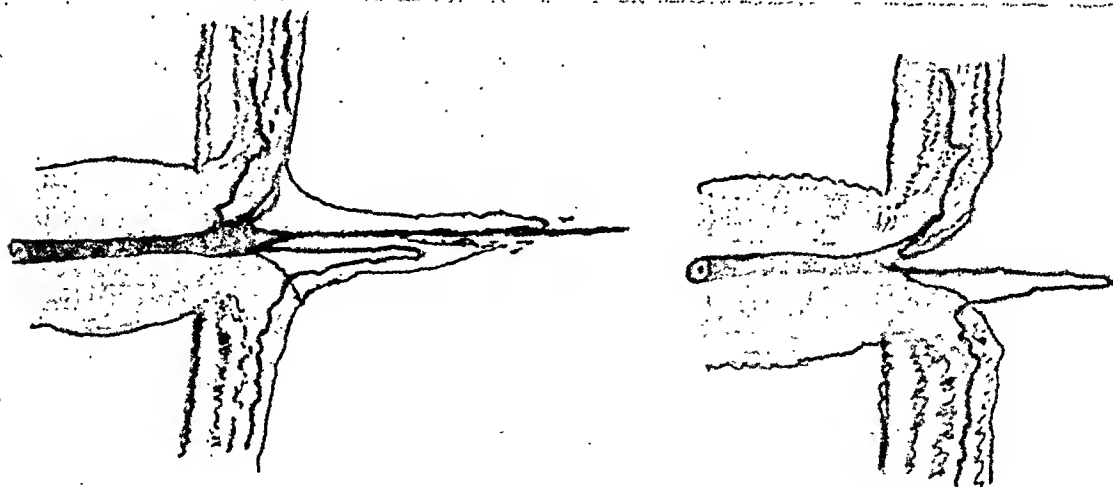


Fig. 5 (Levitt and Lloyd). From "Developmental abnormalities of the eye," by Ida Mann. (Cambridge University Press) Published in U.S.A. by The Macmillan Company. Used by permission.

ture and this is described by Yudkin (*Archives of Ophthalmology*, 1926, volume 55, page 364). Most of the cysts attached to the disc or its vicinity are di-



Fig. 6 (Levitt and Lloyd). Bergmeister's papilla. Fetal eye of about 4 months. Preparation from the collection of Dr. Brittain Payne. The hyaloid artery projects into the vitreous and the vascular loops, always present in the embryonic tissue, are seen in cross section. The line to which the fetal tissue will disappear, can be easily made out.

lated canals of Cloquet and usually have a dilatation at either end with a tube of lesser caliber connecting them like a dumbbell. Of those reported, that by

Hunter Scarlett (*this Journal*, 1922, volume 5, page 941), is reproduced (fig. 7) through his courtesy, as it seems reasonable to assume that our case represents the first stage of the process leading up to this more pronounced defect.

The various students of embryology agree that these cysts are formed in tissue

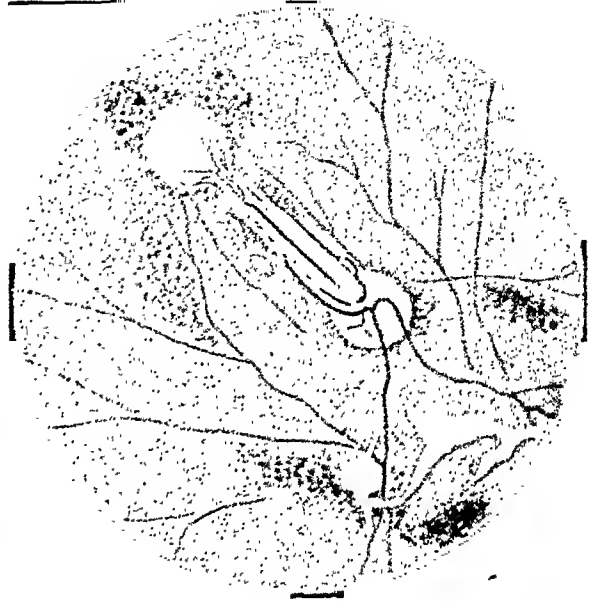


Fig. 7 (Levitt and Lloyd). From Hunter Scarlett's colored reproduction: Opaque canal of Cloquet with persistent hyaloid artery (*Amer. Jour. Ophth.*, 1922, v. 5, facing p. 941; used by permission.)

of ectodermal origin entering the eye along with the blood vessels and found in fetal life on the disc sheathing the hyaloid artery and unnamed vascular loops, bearing the name of Bergmeister's papilla.

SENILE CATARACT: THE USUAL METHOD OF OPERATING IN INDIA*

A REVIEW OF THE INDIAN LITERATURE ON SENILE CATARACT
FOR 29 YEARS INCLUDING THE AUTHOR'S EXPERIENCE

W. A. FISHER, M.D., F.A.C.S.
Chicago

So much has been written describing the different methods of operating on senile cataract, that it has been suggested some surgeon operate on one hundred senile cataracts by the capsulotomy method, one hundred by the Smith intracapsular method, one hundred by the Barraquer method, and one hundred by the blunt forceps method.

To find a surgeon equally skillful in all four methods would be difficult, and his conclusions might be misleading. My belief that I can come as near at this time to making an unbiased report as I could by waiting for more experience is my excuse for offering this report. To give a wholesale report of the operation of senile cataract one must consult the Indian literature. My report will consist largely of what is found in Indian literature, together with some personal experience.

The Bombay Medical Congress in 1909 was divided into sections and was conducted in the same manner as the annual meetings of the American Medical Association, and the intracapsular operation for senile cataract was the topic of the Ophthalmological section.

At the time of this meeting there were two schools of thought regarding the operation of senile cataract, one headed by Colonel Henry Smith and his followers, advocating the intracapsular operation; the other headed by Professor Maynard of Calcutta, Professor Elliot of Madras, and Professor Herbert of Bom-

bay, representing the capsulotomy method.

The meeting seemed to be one-sided, and all the senile-cataract papers were discussions of the intracapsular operation by the Smith method, and practically all who read papers dealing with senile cataract had received their instructions from Colonel Smith.

There did not appear to be any opposition at the meeting to Smith's method of operation, and one would naturally suppose, after reading the papers of the eye section, that Smith's method would be followed by all ophthalmic surgeons, but Smith probably overstressed the fact that his specially trained assistant was indispensable. Naturally, a good assistant is an asset, but he or she is also an asset in the capsulotomy operation as well as in the intracapsular. Two nurses can be made good assistants in a very short time by holding the eyelids open upon each other, using Fisher's lid hooks after instilling two or three drops of two-percent butyn in the eyes, and a similar amount three minutes thereafter.

I am in agreement with many good surgeons that the only way of obtaining the Smith technique is to go to Smith and receive his personal instruction. I held this opinion, and operated in his clinic at Amritsar, India, in 1913, when in four weeks I operated upon 568 eyes for senile cataract with Smith watching and coaching me.

At the first dressing of my first fifty cases there seemed to be far too many cases of prolapsed iris. When I told

* Read before the Chicago Ophthalmological Society, October 4, 1938.

Colonel Smith of this complication he simply said, "Your hand is too heavy," and added that I would notice fewer complications in my next fifty cases. He was right. My hand was too heavy at first, and when I loosened up a bit the iris prolapse was less frequent.

Smith (Indian Medical Gazette 1922 and Smith's book, "Treatment of Cataract," 1928, page 81) advised many operations upon the eyes of six-weeks-old kittens as the best method of obtaining skill in technique. Holland expressed the same view (Eye, Ear, Nose and Throat Monthly, January, 1925) and stated that if the student operated upon one hundred kittens (two hundred cataract operations) before operating on a human eye, he would get more satisfactory work in the Holland Clinic than by any other method.

The afore-mentioned meeting of the Bombay Medical Congress lasted three days, and the eye section had many interesting papers dealing with diseases, some of which are never seen in America and create no interest here. The papers upon cataract (Bombay Medical Congress, 1909) all concerned intracapsular operations:

No capsulotomy papers were contributed.

McKeechnie stated in his paper that Smith adopted the intracapsular operation as a routine in 1899, and operated upon both eyes at the same sitting, and that he had performed 20,000 operations in that manner in 10 years. He stated that in his opinion 200 operations would give one a fair training, but who in America or Europe, or in any place except India, could hope for such extensive training?

Jamison began his cataract surgery in the Smith clinic and reported 260 operations with 1.5 percent iritis, and states that any good operator with a fair amount of work should have equally good

results after he has mastered the Smith technique.

Gidney of Dhubri expressed the opinion that 100 operations amounted to practical experience.

Oxley believes the great advantage of the intracapsular method over the classical capsulotomy operation is the elimination of capsule tags left in the wound and the low percentage of iritis. His conclusions are: (1) the operation is safe for the average operator; (2) it eliminates iritis due to cortical and capsule remains; (3) eliminates incarceration of the iris; (4) corneal incision does not cause excessive astigmatism or liability of infection; (5) detachment of the retina he has not seen.

Mathra Das began his cataract surgery in 1903 by the capsulotomy method, performing 3 operations in 1903, 41 in 1905, 153 in 1906, and 317 in 1907. After visiting Colonel Smith the second time he operated upon 804 patients by the Smith method. (He has used Smith's method since that time.)

Elschnig of Prague, one of the foremost operators in Europe, stated that one should perform at least one hundred capsulotomy operations before attempting the intracapsular.

The average operator in America or Europe would consider himself an expert after performing one hundred cataract operations by any method, and after acquiring that experience would hardly think of making a change.

In "One thousand cataracts in six weeks," by H. T. Holland, Shikarpur, Sindh, India (Indian Medical Gazette, May, 1914) it is stated that he performed 95 percent of senile cataract operations within the capsule by the Smith method, and operates upon both eyes at the same sitting.

Dr. Holland stated that after an experience of 3,000 senile cataract oper-

ations the Smith method is his choice. He also states that one of the great advantages of the Smith method is the practice of the first dressing of the eye on the fifth day, and again on the seventh and eighth days, after which the patient is usually discharged. Holland decided that the increase in his cataract operations from 220 annually to 1,024 annually, which increase occurred within a five-year period, is sufficient proof to him that the results of the Smith method are satisfactory to those upon whom operations have been performed.

Dr. B. Baird of Gouda (Indian Medical Gazette, January, 1914) stated that he had not been fortunate enough to have seen Colonel Smith operate, but he had observed some of Smith's pupils and had read Smith's book. He believes that Smith's intracapsular operation offers the best results.

Smith, in his tour of the United States and Canada (Indian Medical Gazette, February, 1922) performed about 500 senile-cataract operations. He refused no one who had the slightest chance of improvement, and many patients stated that they had been refused operations by other doctors. He told his large audiences that he had no concealed tricks, and many who witnessed the operations thanked him for the opportunity of witnessing the operation of complicated cases. (Naturally by operating upon all persons regardless of complications his percentage of good results would not be increased.)

Capt. M. M. Cruickshank's article, "Complications in 1,322 consecutive intracapsular operations in the Holland Clinic in Shikarpur" (Indian Medical Gazette, 1923) is worth reading and rereading. It was my pleasure to be in the Shikarpur Clinic that season, and as there was no electricity in Shikarpur I had a hand power Barraquer machine made in Bar-

celona, and carried it to Shikarpur. The power was produced by turning the fly wheel by hand. The pump was of the same construction as the electric one used in Barcelona by Professor Barraquer. Dr. Cruickshank's article describes 18 operations that were performed by him, Dr. Holland, and myself. I explained Barraquer's technique as best I could after observing him perform twenty cataract operations in Barcelona.

Fifteen of the operations reported were not complicated, and the visual results were reported as very good, and in three cases the capsules were ruptured. There were no other complications in the three cases with ruptured capsules at the time of operation. In one of these no useful vision resulted, but no cause for visual loss was given. The other two ruptured capsules were reported as successful operations.

The machine refused to function after eighteen operations had been performed, and it could not be repaired in Shikarpur.

Capt. Cruickshank, Dr. Holland, and I were well pleased with the results of eighteen operations performed by us whose experience with that method was very limited.

The month I spent in Shikarpur in 1923 was one long to be remembered. Capt. Cruickshank, Dr. Holland, and I were so engrossed in our work, seeking certain results, that when the time came to depart my only regret was that I could not stay on to perform a few hundred more cataract operations. (I returned to Holland's clinic the following year.)

All methods of incisions were described at the Bombay meeting, but it is my opinion that any well-made incision, either with or without a conjunctival flap, with or without sutures, or one entirely in the cornea, will be good, provided the puncture and counterpuncture are made deep

enough, and the incision embraces nearly one half of the cornea. Such an incision will usually allow free passage of the lens.

There are only a few papers in the literature reporting the results of 1,000 or more cataract operations; however, it is interesting to know that most of the results of 1,000 or more operations recorded in this paper were performed within a period of six weeks.

The Jungle Hospital. In the Indian Medical Gazette (1924) there is a most unusual article entitled, "Notes on seventeen thousand capsulotomy operations," by James MacPheal, Bamdah.

The location of Bamdah Mission Hospital is in the Maughye District; the hospital is operated by the United Free Church of Scotland and is called a Jungle Hospital. The largest town or village is Bamdah, which has a population of four hundred. The hospital was begun in 1900, and an operating room was built in 1903.

In the first year 34 capsulotomy operations for senile cataract were performed; in 1921 the number had risen to 1,440.

The article states that 90 percent of the patients are farmers, that 95 percent of them are illiterate, and that sometimes as many as 50 of them are operated upon in this jungle clinic in one day.

Free operations are rarely performed at the Jungle Hospital, but if every patient would pay one rupee (33 cents in American money) that sum could pay expenses. The patients furnish the food, which is very cheap, and their friends are their nurses and attend to their wants. The cost of private rooms ranges from two anas, or four cents, to ten anas, or twenty cents a day.

MacPheal states that he operated upon 100 patients by the Smith method without having seen Smith or any of his pupils operate, and inasmuch as Smith stated that one must be instructed by him,

MacPheal gave up the intracapsular operation. He states, however, "there is much good to be said about the Smith operation."

A paper by W. A. Fisher and H. T. Holland (Eye, Ear, Nose and Throat Monthly, January, 1925) was read before the Chicago Ophthalmological Society on November 17, 1924, reporting the results of 1,455 cataract operations performed in Dr. Holland's clinic in Shikarpur in six weeks, from January 1 to February 15, 1924. Dr. Holland stated that I was responsible for 868 of the operations, and that the largest number of cataracts operated upon in one of these days was 114, and on the following day 85. He also stated that all of the 199 eyes were operated upon by me.

This is not only the largest number of cataract operations performed by me in two succeeding days in the Holland clinic, but the largest number recorded in literature in any clinic.

In Dr. Holland's paper he refers to Dr. Parker's paper presented to the American Medical Association in 1921 reporting 1,421 cataract operations, and quotes Parker as being unable to give visual results in 152 of them, and that it would be much more definite to tabulate the results surgically, irrespective of the visual results obtained.

If visual results are impossible in large numbers in the United States where illiteracy is not found, how can operators in India, where illiteracy is as high in some places as 90 percent, be expected to furnish visual results?

Illiterate or educated, as the case may be, good results can be expected after an uncomplicated intracapsular operation, when the cornea is clear, the fundus normal, and the healing process free from inflammation.

Doctors Barraquer, Benedict, Davis, Elschnig, Fisher, Gailey, Gradle, Greene,

Knapp, Lancaster, McReynolds, Parker, Pratt, Safar, and many others have reported visual results, but when good visual results are obtained it only proves that the credit should be given to the operator rather than the method of operating.

For ten years before going to India, I operated by the classical capsulotomy method; then followed four seasons in India, where I was privileged to operate upon more than 2,000 eyes by the Smith intracapsular method.

I visited Colonel Smith in 1913, and for 15 years thereafter, in an active operative clinic and in private practice, the Smith intracapsular method was selected; after this for 10 years the fascinating method of Barraquer and the blunt capsule forceps were used.

The key to the whole operative subject is, in my opinion, ambidexterity. "Ambidexterity has no meaning in eye surgery for there is no advantage to be gained by it." (Quotations from Smith's book, "Treatment of cataract," 1928, page 81.)

Smith, Holland, and others who have had much experience, do not claim to be ambidextrous but use their best hand for the incision and delivery of the lens.

Intracapsular operators, using the suction, or Barraquer, method, or the blunt forceps, require a higher degree of ambidexterity than those using the Smith method, because in operating by the Barraquer or forceps method, pressure must be made with one hand and traction with the other.

The Smith operation is performed by making the incision on the right eye with the right hand, while standing behind the patient's head, and on the left eye with the right hand, standing on his left side, cutting up, if one is right handed, and just the reverse, if one is left handed. The cataract is removed by pressure, using one's best hand.

Beginners, there is no excuse for any doctor to class himself as a novice in cataract surgery, because operating upon the eyes of 100 six-weeks-old kittens (two hundred cataracts—Fisher's "Senile cataract," ed. 3, 1937) will give him a good practical technique, and he may then expect to be rewarded by good results. A similar technique could not be obtained by observing others for an extended period, and after that experience performing a few operations.

30 North Michigan Avenue.

NOTES, CASES, INSTRUMENTS

A CASE OF MYELOGENOUS LEUKEMIA WITH GLAUCOMA DUE TO HEMORRHAGE

J. ARTHUR BUCHANAN M.D.,
AND HARRY A. BALLWEG M.D.
Brooklyn, New York

A large ocular hemorrhage with glaucoma in the course of myelogenous leukemia appears to be a rather uncommon clinical condition. Reports of such cases in the literature are rare. The authors have been unable to find any reference to this complication of leukemia in the Quarterly Cumulative Index for the past 10 years.

OCULAR FINDINGS

The usual ocular changes found in myelogenous leukemia occur in the retina, especially at the periphery of the fundus. The fundus is abnormally pale. The vessels are less clearly outlined than normally and hemorrhages may be found, usually close to the vessels. Exudates may also be seen lying close to the vessels. These commonly appear as white flecks with a red border, in most instances of small size, irregular in shape, and sometimes striated.^{1, 2} They represent collections of leucocytes and degenerated nerve elements surrounded by traces of hemorrhage. Less common findings include the involvement of the optic nerve with blurring of the disc outline, or actual swelling. Retinal detachment, clouding of the lens, and hemorrhage into the vitreous have been described. Cabot has seen two cases of unilateral exophthalmos, probably due to leukemic infiltration or hemorrhage into the orbit.³

The importance of ophthalmoscopic examination is to be stressed, for typical changes in the fundus may be found before there is any dimness of vision. Dis-

turbances of vision may occur early or late in the disease, and of course depend upon the location and extent of the ocular lesions.

The following case has many interesting phenomena. The patient was under observation for five years before leukemia developed.

CASE REPORT

The patient, a 53-year-old, married, white woman, was first seen on December 6, 1927. The family history revealed that she had had a brother who had died at the age of 34 years from a carcinoma of unknown location. One sister had died in childbirth, another was living and had a peptic ulcer, and a third had a dermatological abnormality, similar to that of the patient, which we shall designate as hyperplastic keratosis of the skin. Her parents had both died from unknown causes when more than 80 years of age.

The chief complaint was pain on top of the head, back of the neck, and over the right ear. These pains had begun about four years previously, but had been very severe for the last three weeks. Several years before she had had a similar severe pain in the right side of her head and the next day had amblyopia of the right eye, which was said to have been due to hemorrhage in that eye. Normal vision was subsequently restored. Secondary complaints were nervousness, a feeling of shakiness, and occasional hot flashes. Her last menstrual period had been a year previously. She tired easily, and stated that she had always had a tendency to be "anemic." She had suffered for months from sudden blanching of the fingers on exposure to cold.

The systolic blood pressure was 140 mm. of mercury, the diastolic, 100 mm.

There were many keratic patches on the face and abdomen. These patches were brown in color, flat or slightly raised, and varied in size and shape. Some especially large ones were noted on the right side of the abdomen. The blood count was as given in table 1. The urinalysis showed normal findings throughout the whole period of observation. The Wassermann test was negative.

The patient was seen again on December 10, 1927. Little change was noted. The blood pressure was 160/110.

Another visit on January 3, 1928, failed to reveal any essential change.

Two weeks later, January 17, 1928, the patient complained of soreness of the mouth, gastric distress, nervousness, and tiredness. She had lost many of her skin lesions following X-ray therapy.

The further course of the condition was uneventful until the summer of 1931, when she complained of "seeing wheels." The description given by the patient is as follows: "I am seeing wheels, wheels, and more wheels. (Her diagram of it is shown in figure 1.) They are very bright and move very fast. Then after a time, 10 to 30 minutes, they go off into space gradually, and my vision is clear again. In the meantime I am practically blind. All I can see are those awful things, eyes open or closed." The patient stated that she had experienced these optical sensations from the age of 16 years until three years before (1928). During the summer of 1931, these sensations occurred almost daily, and were preceded by a feeling of exhaustion. In earlier years, the aftermath of such an experience was invariably a severe headache, but now the patient felt well after the episode. Some relief had been obtained with bile salts as a laxative.

On October 9, 1931, the blood pressure was 160/80. Many of the keratic patches had disappeared as a result of

continued X-ray treatments, but there were still a few on the abdomen. The laboratory tests were negative.

The scotomata appeared less frequently while the patient took milk of magnesia and bile salts. However, she tired easily,

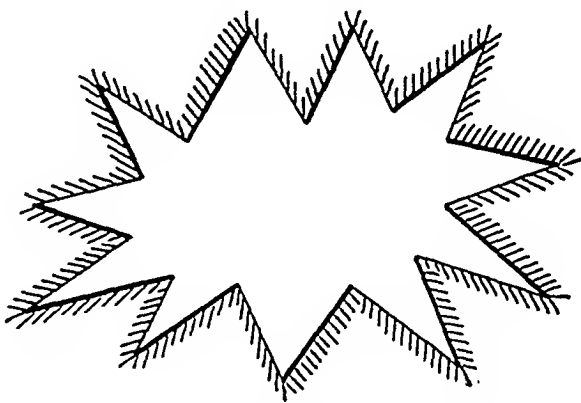


Fig. 1 (Buchanan and Ballweg). Diagram of transient scotoma.

and felt a weakness, most marked on the left side. She felt nervous and was emotional, stating that she had lost confidence in herself and was disposed to give herself up to crying spells.

Myelogenous leukemia found. On March 25, 1932, she reported that her left eye had bothered her, that vision was blurred in this eye, and that she had noticed a subconjunctival hemorrhage in the left eye. She admitted that she had, at times, noticed blind spots in her field of vision.

On examination, her vision was essentially the same as it had previously been, but she stated that objects appeared blurred. In the left eye, subconjunctival hemorrhages and a small hemorrhage into the iris were noted. The media were clear and the fundi were essentially normal. There was a pallor of the nail beds. The abdomen was tense and the edge of the spleen was palpable below the costal margin. Many keratic patches were seen on the body. The blood pressure was 178/98. A blood count was taken and repeated twice in the next three days, as shown in

table 1. On March 28, 1932, the spleen was felt to extend 11 centimeters below the costal margin, and was slightly tender.

A diagnosis of myelogenous leukemia after radiation to the spleen and tibiae. The blurring of vision gradually decreased as the hemorrhages into the conjunctiva and iris were resorbed. The spleen became smaller, until on April 13,

TABLE 1
CHRONOLOGICAL LABORATORY DATA FROM A CASE OF MYELOGENOUS LEUKEMIA

Date	Red Blood Count	Hemoglobin	White Blood Count	Poly-morpho-nuclears percent	Differential			Myelo-blasts percent
					Lymph-o-cytes percent	Endo-thelio-cytes percent	Myelo-cytes percent	
12/ 8/27	3,880,000	85 (Dare)	6,400	73	16	11		
		80 (Newcomer)						
10/ 9/31	3,220,000	72 (Dare)	8,750	66	30	4		
3/25/32	3,640,000	74 (Dare)	112,050	32	17		51	
3/26/32		72 (Dare)	75,750	52	20		24	
3/28/32			91,400	34	18		48	
4/ 4/32		77 (Dare)	75,700	32	28		40	
4/13/32	3,700,000	71 (Dare)	67,500	41	22		37	
4/20/32	3,520,000	72 (Dare)	70,500	23	29	4	44	
5/ 4/32	3,800,000	76 (Dare)	58,100	26	28		46	
5/17/32	3,880,000	72 (Dare)	64,600	36	20		34	
6/ 1/32	3,720,000	76 (Dare)	82,850	34	26	1	39	
6/15/32	3,750,000	76 (Dare)	80,200	36	28		34	
6/29/32	3,530,000	74 (Dare)	84,900	23	18		59	
7/13/32	3,700,000	74 (Dare)	100,750	16	18		66	
9/14/32	3,550,000	74 (Dare)	101,850	18	24		58	
10/ 8/32	2,920,000	55 (Dare)	89,400	28	28		46	
10/14/32	3,030,000	60 (Dare)	142,950	22	18		57	3
10/24/32	3,170,000	67 (Dare)	132,200	25	26		49	
10/31/32	3,260,000	70 (Dare)	73,400	44	16		40	
11/ 9/32	3,430,000	70 (Dare)	22,100	26	26		46	
			21,850					
11/23/32	2,370,000	64 (Dare)	16,250	47	16		35	2
12/ 7/32	3,260,000	62 (Dare)	6,650	41	28		23	4
12/21/32	3,690,000	70 (Dare)	5,400	47	24		22	
1/ 4/33	4,090,000	78 (Dare)	17,600	56	36		8	
1/17/33	4,110,000	82 (Dare)	37,550	73	18		9	
		80 (Dare)						
2/ 3/33	3,630,000	72 (Dare)	68,600	70	10		18	2
2/15/33	4,140,000	78 (Dare)	32,350	53	9		38	
3/ 1/33	4,260,000	80 (Dare)	64,260	42	18		38	2
3/15/33	3,990,000	80 (Dare)	56,800	60	24		15	1
3/29/33	3,790,000	78 (Dare)	63,000	42	26	2	28	2
4/13/33	4,060,000	80 (Dare)	71,200	49	16	2	29	4
4/26/33	3,280,000	74 (Dare)	131,800	39	22		40	1
7/28/33	3,600,000	78 (Dare)	182,550	40	22		38	
9/ 6/33	2,860,000	62 (Dare)	236,200	36	20		44	

was made and X-ray therapy was advised.

The patient, who had been seen frequently and examined carefully over a period of more than four years, developed myelogenous leukemia during an interval

1932, it was two centimeters below the costal margin and one week later, barely palpable. Table 1 shows the decrease in white cells.

In July, 1932, the leucocyte count began to rise and the spleen became larger and tender, despite continuance of radiation therapy. However, she felt fairly

well and tired less readily than in the months before. Her left eye continued to improve objectively and subjectively, but not to normal limits.

In October, 1932, she began to feel worse, was weaker, and tired more readily. She looked pale and thin, having lost 15 lbs. in a month, from 168 on September 14th to 153 on October 8th. She complained of pain in the splenic area constantly. The blood pressure was 160/80. On October 14, 1932, Fowler's solution M viii t.i.d. was prescribed, as the patient refused further radiation therapy.

On October 30, 1932, another fairly large-sized subconjunctival hemorrhage occurred in the left eye, without further impairment of vision. The dose of Fowler's solution was increased to M x t.i.d. at this time, and to M xii t.i.d. on November 9, 1932.

On November 23, 1932, the patient called attention to the fact that she had developed many new skin lesions since taking Fowler's solution. Some of these lesions were flat and brown, and others were elevated, and had the general characteristics of verrucae vulgaris. The patient felt weak and was dyspneic. Ventriculin 5 ii t.i.d. was added as a therapeutic measure.

On December 7, 1932, the patient complained of numbness and deadness of hands and feet. The Fowler's solution was discontinued. Two weeks later, the numbness of the fingers was better. Many of the keratic patches had disappeared. The spleen was smaller and softer. The gait was seen to be slightly ataxic, and the patient thought her hearing was less acute. Edema of the legs developed, but the general condition remained about the same.

About January 20, 1933, the patient complained of loss of vision in the left eye and pain in the left eye, left cheek, and forehead. Upon external examina-

tion the conjunctiva of the left eye was found to be injected, and remnants of old subconjunctival hemorrhages were present; the pupil reacted sluggishly to light, and vision was the ability to perceive light but no images. Upon ophthalmoscopic examination, the fundus was not visualized, nor was a normal red reflex obtained. The anterior chamber, cornea, and lens were found to be clear. Transillumination of the eyes exhibited a difference between the two eyes in that the light obtained from the right eye was brighter than from the left. The intraocular tension was increased, and a diagnosis of glaucoma, associated with myelogenous leukemia, due to hemorrhage into the vitreous, was made. An X-ray study of the left eyeball gave no positive information. Decompression of the left eye relieved the symptoms of acute glaucoma, but vision was not restored, for the hemorrhage into the vitreous was not resorbed.

Following this episode, there was a remission, during which the patient looked and felt better. Many of the keratic patches disappeared. She was stronger, and her gait had improved. She spoke of a dull discomfort in the left eye, which appeared reddened. The cardiac symptoms of dyspnea and edema, which she had had, were relieved. However, during this time, the spleen enlarged continually and was quite hard. By April 26, 1933, the lower edge had reached the level of the umbilicus.

Despite the increasing leucocyte count there was no relapse until September, 1933, when she began to have hemorrhages into the muscles of the back, and had a daily febrile reaction. These hemorrhages formed masses about 8 cm. in diameter. They would gradually soften and fluctuate, and finally be absorbed, only to reappear. The fever of 100° to 103°F. continued. The spleen occupied

the entire left side of the abdomen, from the costal margin to the iliac crest. Vomiting and diarrhea began and extreme weakness ensued. All attempts to sustain life failed, and the patient died on September 26, 1933.

COMMENT

This case is interesting, not only as an example of a rare ocular complication of myelogenous leukemia, namely, acute hemorrhagic glaucoma with hemorrhage into the vitreous, but also because there are few data available concerning the interval of development of myelogenous leukemia. Here it developed in an interval

of five months in a patient under observation for five years. The biological background of the family is suggestive that myelogenous leukemia may belong in the category of neoplastic diseases, as a brother had carcinoma, while the patient and a sister had multiple hyperplastic keratic patches of the skin. For years the patient had suffered from the local syncope stage of Raynaud's disease and the symptom complex designated migraine. She had had ocular hemorrhages years prior to the development of myelogenous leukemia.

510 Ocean Avenue.

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A CASE OF RECURRENCE OF OCULAR HYPERTENSION EIGHTEEN YEARS AFTER AN ELLIOT OPERA- TION

MARK J. SCHOENBERG, M.D.
New York

The importance of recording the course and evolution of a disease in the same patient over a period of many years has long been recognized by clinicians. Considering that glaucoma has always been regarded as a very perplexing problem, one would expect that careful records of minute details concerning glaucomatous patients, observed during the greatest part of their lifetime, would have been accumulated by now—ready for study and interpretation. A search of the literature on this subject reveals that there are no records of this kind. All we can find is that a number of papers have been

published on late results obtained by the aid of certain operative methods for the treatment of primary glaucoma. These reports cover the impressive number of 2,263 operations. None of these papers gives a detailed account of the curves of ocular tension, of vision, of fields of vision, and changes as seen by the aid of biomicroscopy over a period of several years.

Gjessing¹ reports on two cases which were doing well four and six years, respectively, after operation, but the patients became blind four to five years later.

Dr. A. Knapp's² patient remained well for 11 years; then developed ocular hypertension on account of closure of the trephine opening.

Of Ploman's and Granström's³ five patients, one remained well for 18 years and four for three, five, and eight years, respectively.

Gertrud Hausman⁴ had one case of re-

currence of ocular hypertension 20 years after the operation and another patient remained well for 14 years.

Altogether we find in the literature reports of two cases in which recurrence of ocular hypertension took place 10 or more years after an operation.

lights. A similar condition had developed three years previously, following a tonsillectomy. At that time, the eye cleared up without medical attention.

The examination revealed nothing abnormal in the right eye, but in the left eye the pupil was somewhat enlarged, and

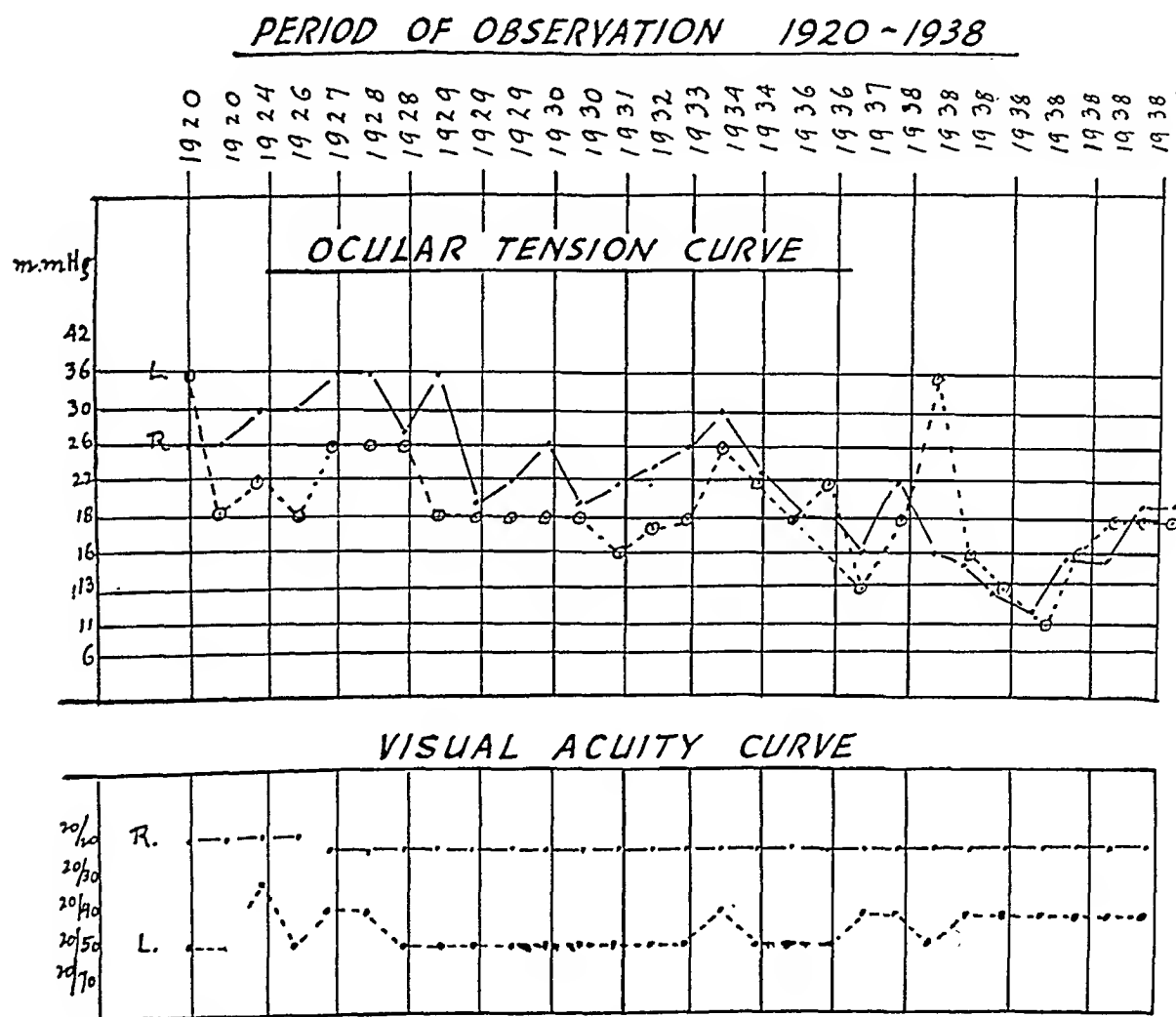


CHART 1 (Schoenberg). Intraocular-tension and visual acuity curves.

The case herein reported concerns a patient, S. N., who came under my observation 18 years ago. His age was 42 years; his occupation, that of a writer. He was nervous, easily excitable, and highly cultured. He complained that after an attack of influenza, three weeks previously, he began to have attacks of pain in his left eye, dimness of vision, and perception of rainbow circles around

the tension, 35 mm. (Schiotz). Vision: R.E. with a +3.50 D. sph. \approx + 2.25 D. cyl. ax. 90°, was 20/30; L.E. with +3.00 D. sph. \approx +3.50 D. cyl. ax. 75°, was 20/200. Pilocarpine and eserine drops reduced the tension to normal. It remained at that level as long as the patient used the instillations regularly. However, since the patient was inclined to become careless with the use of the

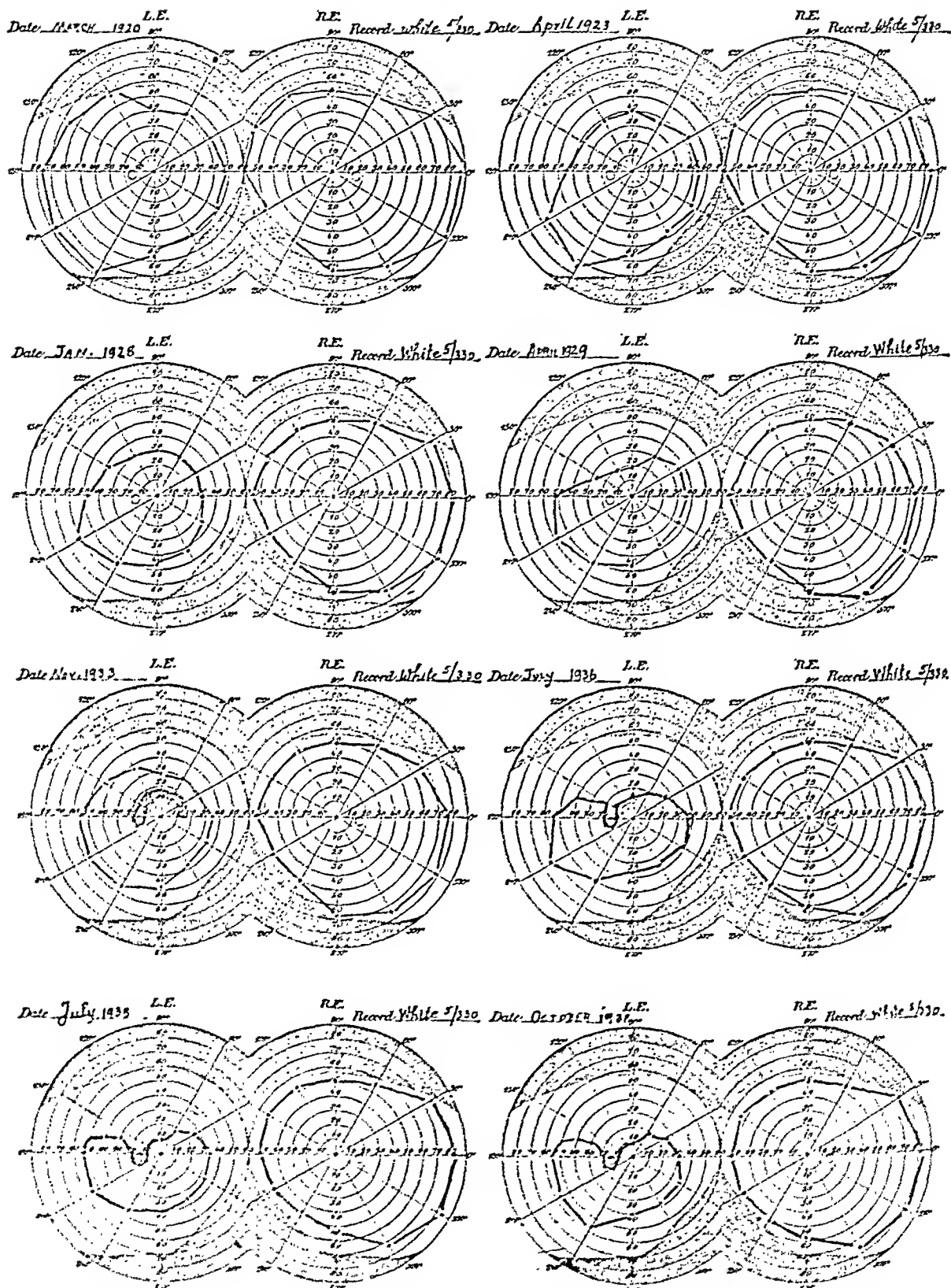


Fig. 1 (Schoenberg). Record of fields of vision from March, 1920, to October, 1938.

should become more seriously damaged. An Elliot trephining was performed; this, 18 years ago.

The right eye was watched for about one year. During this time the patient had several minor attacks of ocular hypertension, "rainbows," and cloudiness of vision—whenever he neglected the instillations of the drops in his right eye. Even after an iridectomy, pilocarpine had to be instilled once or twice daily to keep the tension within normal limits. The left eye kept its normal tension right along, without any drops. The rest of the story can be more easily grasped by studying chart 1.

Notice the tendency of the tension curve of the right eye to be somewhat higher than normal, especially when the patient neglected to use the pilocarpine regularly. However, occasionally the tension remained normal in this eye for a few months without drops.

The tension curve of the left eye remained normal for 18 years without the use of drops. In June, 1938, an acute crisis occurred. It consisted of severe pain on the left side of the head and in the left eye and blurring of vision.

This crisis yielded to frequent instillations of pilocarpine, 2 percent (every one to two hours), and ice applications. After a few days the tension was reduced to a level much below the patient's average normal (see chart 1). A few weeks later, it returned to its previous normal level (18 mm. Hg) and remained there without the use of any more drops.

In spite of the persisting normal ocular tension in the left eye, during the course of 18 years, the field of vision underwent a very slow, partial deterioration which, however, did not involve the central vision. This fact suggests that the damage to the optic nerve in this eye was

due to a factor other than ocular hypertension.

The record of this case, though incomplete in many respects, deserves to be reported for the following reasons:

1. It affords the opportunity of visualizing the course of the ocular tension, acuity of vision, and fields of vision of both eyes over a period of 18 years after an operation.

2. It relates the recurrence of ocular hypertension in one eye after these many years. The recurrence was not due to a uveitis nor to a subluxation of the lens; both are readily recognizable by a careful examination. One may safely dismiss the question of closure of the trephine opening or of other parts of the drainage system (angle of the anterior chamber, Schlemm's canal, venae vorticosae, or of the retinal veins), because this sort of closure is organic and quite permanent and is not liable to respond readily to pilocarpine, as it did in this patient. (See tension curve in chart 1 after the acute crisis.)

3. It brings to the foreground the question: "What might be the meaning of the marked drop of the ocular tension in eyes which have just passed through a crisis of ocular hypertension?" Is this hypotension due to the intensive treatment during the attack or to a collapse of the factors which bring about the ocular hypertension?

4. It suggests that no case of glaucoma which remains well for a number of years may be considered as permanently cured, because of the possibility of a late recurrence of ocular hypertension or of a very slowly progressing optic atrophy.

667 Madison Avenue.

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A SUBSTITUTE FOR THE HILDRETH LAMP AND A NEW USE FOR BOTH

MEYER H. RIWCHUN, M.D., F.A.C.S.
Buffalo, New York

The Hildreth lamp has been a most valuable addition to the ophthalmologist's armamentarium. Many men, either be-

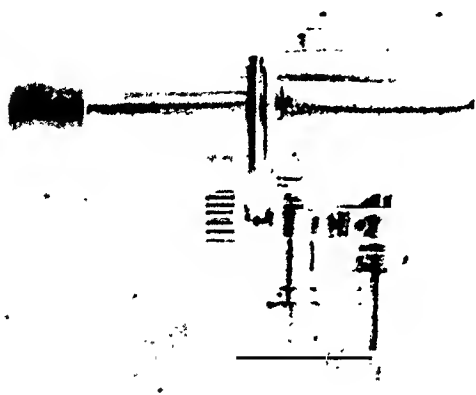


Fig. 1 (Riwchun). A filter caps the end of the operating lamp.

cause of lack of space or limited finance, have failed to avail themselves of this lamp even though they admit its need and usefulness.

At the last academy meeting in Washington, D.C., I spoke to Dr. Max Poser and Mr. Howard Trimby of the Bausch and Lomb Optical Company about a filter on their operating lamp that could be used as a substitute. They constructed one for me as illustrated. The glass used is

their no. 584 ultraviolet glass with absorption based on a 2.07-mm. unit of thickness. The secret of its effectiveness in the fluorescence of the crystalline-lens substance is based on the restrictive transmission of between 4,000 and 3,000 angstrom units. The maximum transmission point is at about 3,600 A.U.

Using this filter on the regular Bausch and Lomb operating lamp with maximum current control of light, a good fluorescence of the crystalline lens¹ is obtained; not so efficient as that from the Hildreth lamp but quite practical. At the present writing we are working on a lower-voltage bulb that can be overloaded (similar to a photoflood bulb) and hence give more light to step up the efficiency.

I find this filter very useful in the examination of corneal ulcers, erosions, and abrasions. After the cornea has been stained with fluorescein in the usual manner, the room is darkened and the light focused on the eye. The stained area stands out in startling contrast and a better picture of the extent and size of the lesion is obtained than has heretofore been possible. Perhaps additional uses for this filter² may be uncovered by more universal use.

The advantage of this filter is its low cost (around \$5.00), simplicity of operation, and adaptability to one's present equipment.

367 Linwood Avenue.

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A TOOTHLESS IRIS FORCEPS

M. LOMBARDI, M.D., F.A.C.S.
Brooklyn, New York

The main complication due to the use of toothed forceps is the subject of an

article by Kornelia Graf (Amer. Jour. Ophth., 1932, v. 15, p. 162) entitled "Iridectomy and lens injury." The author studied histologically the excised piece of iris from each of 22 cases of iridectomy for glaucoma. Lens capsule was found

adherent to the iris four times and in each instance a toothed forceps had been used. Loose capsule was also found in three cases out of 23 iridectomies done for other purposes, in which the same type of forceps had been used, while no such complication was observed in another series of nine cases in which iridectomy had been performed with anatomical forceps. From the evidence obtained the writer concludes that the toothed iris forceps is a dangerous instrument.

A toothless iris forceps* which I have been using in recent years is shown in the accompanying illustration. It is made in a long model of 9.5 cm. and a short model of 6.5 cm. The branches of each model end in a slight curve and present a special rasplike surface on the inner side of the terminal three millimeters.

The advantages derived from this new type of forceps can be summarized as follows: (1) The gentle curve allows the

branches when closed to enter and proceed easily into the empty anterior chamber as far as desired, even to the margin of a contracted pupil. (2) The forceps by its rasplike surface is able to grasp firmly the proper amount of iris tissue, prevent-

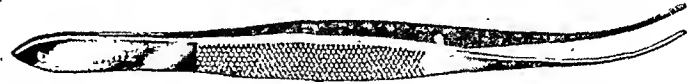


Fig. 1 (Lombardo). A toothless iris forceps.

ing it from slipping away before the excision can be performed. (3) The iris can be instantaneously released by simply reopening the branches at any time. (4) The lens is not injured during the manipulations of the forceps; the elimination of teeth, in fact, avoids the perforation of the thin iridic membrane and then the injuring of the underlying lens capsule. (5) The instrument can be used as a blunt capsule forceps: it can grasp the intact capsule or its right and left halves after it has been split vertically with the cystotome.

142 Joralemon Street.

* The instrument is made by E. B. Meyrowitz Company, New York, New York.

SOCIETY PROCEEDINGS

Edited by DR. H. ROMMEL HILDRETH

CHICAGO OPHTHALMOLOGICAL SOCIETY

October 24, 1938

DR. GEORGIANA D. THEOBALD, *president*
KODACHROME CLINIC, SERIES III

DR. ROBERT VON DER HEYDT presented a new series of 75 Kodachrome fundus and anterior-eye photographs of clinical cases.

Discussion. Dr. Elias Selinger asked Dr. von der Heydt how it was determined that the dermatitis shown in one of the patients was a result of the quinine treatment. He recalled three patients, treated for trachoma with quinine bisulfate, who developed a dermatitis of the lids. Treatment was discontinued for awhile and then different medication was used. The dermatitis recurred after each form of treatment—copper stick, bichloride of mercury, chaulmoogra oil, boric acid, and other drugs. On doing patch tests it was found that each of the three patients was allergic to the pontocain that was used as a preliminary anesthetic. When a different local anesthetic was used there was no further difficulty with the quinine medication. There is little doubt that quinine, like other drugs, may induce a dermatitis, but one should remember that local anesthetics used as pre-medication may be the cause of a dermatitis.

Dr. Robert von der Heydt said that he had no explanation for the occurrence of dermatitis in this case. A series of 16 patients at the Infirmary were treated with sulfanilamide, and when they were photographed the patient was brought to him with this diagnosis. He said that Dr. Selinger has made an important addition to our therapeutic armamentarium by his use of quinine bisulfate in the

treatment of trachoma, and no criticism was intended. It is quite probable that the dermatitis was instigated by an anesthetic.

OPHTHALMIC SURGERY AT MISSIONS IN INDIA

DR. SAMUEL HIGGINS read a paper on this subject which will be published in this Journal.

SENILE CATARACT: THE USUAL METHOD OF OPERATING IN INDIA

DR. WILLIAM A. FISHER read a paper on this subject which is published in this issue of the Journal.

Discussion. Dr. Harry Woodruff said that when Colonel Smith visited America a number of years ago, he made the statement that some method would be found to paralyze the orbicularis muscle. He certainly recognized that control of this muscle is an important factor in the intracapsular operation. Not only has this been brought about by either the Van Lint or O'Brien methods, but also more thorough anesthesia has been obtained by intraorbital injections. The intracapsular method is now apparently as safe as the extracapsular method.

Dr. O. B. Nugent was of the opinion that whatever one might say about the Smith operation—good or bad—from that operation has been salvaged much that is used in modern operations; namely, the method of expressing the lens. Credit must be given to Colonel Smith for that part in the modern method of cataract extraction.

Dr. Samuel Higgins (closing) repeated that his choice of operation came after many years' experience with various methods. His early training had been with the extracapsular operation, which was followed by intracapsular methods, both

the form of adjunct apparatus to the slit-lamp.

Louis A. Feldman,
Transaction Editor.

SAINT LOUIS OPHTHALMIC SOCIETY

October 14, 1938

DR. ROY E. MASON, *president*

OCULAR FACTORS IN POOR READERS IN THE SAINT LOUIS PUBLIC SCHOOLS

DR. F. O. SCHWARTZ read a paper on this subject which will be published in this Journal.

PAREDRIENE AS A CYCLOPLEGIC

DR. ALAN D. CALHOUN read a paper on this subject.

Discussion. Dr. John Green said that paredrine (B-4 hydroxylphenylisopropylamine) is not a new drug. It was originally entered in the German Patent Office in 1913, and belongs to the class of sympathomimetic drugs; its chemical structure is closely allied to that of epinephrine and ephedrine.

A recent pharmacologic study by Abbot and Henry (Amer. Jour. Med. Sci., 1937, p. 661) disclosed the following: 1. It increases the blood pressure (10-20 mg. subcutaneously, 20-40 mg. by mouth); 2. The central nervous system is stimulated, probably due to increased flow of blood to the brain; 3. By topical application (3-percent solution) it is as effective in relieving congestion of the nasal mucosa as a 3-percent solution of ephedrine. It has, however, the disadvantage of not being soluble in oil.

In percentages varying from 0.15 to 2, it acts as a mydriatic, but not as a cycloplegic; that is, these authors found no loss of accommodation following the instillation of the drug alone. There was no

conjunctival nor ciliary congestion and no increase in intraocular pressure.

A recent study by Sudranski (Arch. of Ophth., 1938, v. 20, no. 4, p. 585) indicates that benzedrine (a drug closely allied to paredrine) is totally lacking in cycloplegic effect. He questions the synergistic effect of the two drugs in combination, believing that a 5-percent solution of homatropine alone uncovers 90 percent of the hyperopia and is efficient alone in the production of transitory, but clinically efficient, cycloplegia. Further studies are needed to get at the truth of the matter.

Dr. Lawrence Post said that they had been using paredrine for a few months, but not in the critical manner of Dr. Calhoun. They did take the near point and found some residual accommodation, the near point being 29 cm. to 30 cm. instead of 33 cm., which was not very different from that in a group of patients in whom they used five instillations of 2-percent homatropine. Their method was to use a drop of 5-percent homatropine and three minutes later a drop of paredrine. The method has the advantage of quick recovery. It is simpler in children because of the fewer instillations and is of advantage to the group of patients who must use their eyes the following day.

Dr. Calhoun said that he would like to test how much cycloplegic effect was obtained with a drop of 5-percent homatropine. It is true that Drs. Abbott and Henry did say there was no cycloplegic effect with paredrine alone. He intends to study a series of cases using 5-percent homatropine alone.

SULFANILAMIDE THERAPY IN OCULAR DISEASES

DR. J. M. KELLER read a paper on this subject.

Discussion. Dr. Lawrence Post said he had recently returned from a conference

of the Indian Service. There were enthusiastic reports of the use of sulfanilamide among the Indians. One was a report of 112 cases followed for six months in which all but eight were reported as cured or arrested. They were talking of the possibility of the elimination of the disease among the Indians in a few years' time. They use one-third grain per body weight, per day. It can be obtained in tablet form. The usual course used in Indian children originally ran for three weeks. They decided to give it a little more intermittently after the first week and ran it to six weeks' time. Patients were cautioned to take things easy during the course of the treatment. The blood picture was carefully observed. Soda bicarbonate was given in equal amounts with the sulfanilamide.

Dr. Max W. Jacobs stated that he recently saw a patient who suffered severely

as a result of exposure to sunlight while taking sulfanilamide. This case showed how essential it is to know how the blood is behaving and that there are risks in giving the drug to ambulatory patients.

Dr. Keller said that older patients were carefully examined before sulfanilamide was administered. In one trachoma case in which he used sulfanilamide the vision after two days had certainly improved. The case, however, is one complicated with keratitis. In the other case of trachoma there was a black conjunctiva from the use of so much silver. He believed it not necessary to use the high dosage of sulfanilamide. Such cases will respond to small doses as well. If the condition does not show any improvement in a week, sulfanilamide will do no good.

H. Rommel Hildreth,
Editor.

AMERICAN JOURNAL OF OPHTHALMOLOGY

Published Monthly by the Ophthalmic Publishing Company

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Author's proofs should be corrected and returned within forty-eight hours to the *Manuscript Editor*. Twenty-five reprints of each article will be supplied to the author without charge. Additional reprints may be obtained from the printer, the George Banta Publishing Company, 450-458 Ahnaip Street, Menasha, Wisconsin, if ordered at the time proofs are returned. But reprints to contain colored plates must be ordered when the article is accepted.

MEETING OF THE AMERICAN OPHTHALMOLOGICAL SOCIETY

The American Ophthalmological Society held its seventy-fifth annual meeting on June 5, 6, and 7, 1939, at Hot Springs, Virginia. One hundred thirty-five members and guests were registered, the largest attendance on record. Mr. H. M. Traquair of Edinburgh was the guest of honor and spoke on "Some problems in perimetry" at the session on June 6th. That evening a banquet celebrating the anniversary was held. The president of the society, Dr. Frederick T. Tooke of Montreal, presided. Mr. Traquair spoke on "The Ophthalmological Society of the United Kingdom," Dr. Harry Friedenwald of Baltimore

gave an exhaustive and scholarly address on "The American Ophthalmological Society, a retrospect of 75 years," and Dr. Bernard Samuels of New York spoke on "Edward Delafield, a sketch," illustrating his talk with interesting lantern slides of Delafield and his times. The members, guests, and their ladies enjoyed the occasion, which incidentally was held exactly 75 years to the day from the time of the founding of the Society.

Twenty-six papers were read, including that of Mr. Traquair. These covered a wide range of subjects and were unusually good. Most of them were of clinical moment, but several were pure research in nature, with much promise for future clinical application. The discussions were interesting, but the length

of the program no doubt decreased to some extent the number of discussers. The weather and arrangements were perfect, and the social side of the activities left nothing to be desired.

Dr. E. V. L. Brown of Chicago was elected president, and Dr. F. Phinzy Calhoun of Atlanta vice-president for the ensuing year. Dr. Eugene Blake of New Haven was reelected secretary.

A group photograph of the members taken on the terrace of The Homestead in brilliant sunshine on June 6th will serve as a permanent souvenir of the event.

Derrick Vail.

STERILIZATION FOR HEREDITARY EYE DISEASE

Modern civilization has been accused of running counter to the laws of evolution by preserving the physically weak. War destroys the finest physical specimens, while medical science and public health administrations prolong the lives of those who in earlier centuries would have been eliminated from the struggle at an early age.

The present rulers of the German people, with their doctrine of racial purity and their apparent ambitions toward world supremacy, have moved more radically than any other government in the direction of sterilization of the unfit.

There are differences of opinion as to how far sterilization succeeds in attaining its ends. As regards some forms of mental and moral defectiveness, it has been argued that the outcome is problematic and that society is just as likely to be the loser as the winner if reproduction is interfered with. Most physicians, however, would probably favor a well-controlled scheme for sterilization of the worst type of criminal, the hopelessly insane, and the imbecile, as well

as some morons whose sexual instincts are dangerous to themselves or to others.

In view of the law enacted by the National Social Democratic Workmen's Party, (the "Nazis,") it is not surprising that during the last few years discussions as to the extent to which certain conditions justify sterilization have been frequent in German eye journals. Among the disorders to which the arguments for and against have been applied may be mentioned congenital anophthalmos or microphthalmos, pigmentary degeneration of the retina, high myopia of the degenerative type, and congenital cataract.

At the last meeting of the German Ophthalmological Society in Heidelberg (*Klinische Monatsblätter für Augenheilkunde*, 1938, volume 101, page 134) Fleischer raised the question whether the possibility of treatment of an inherited disorder excluded the application of the "law for prevention of hereditarily diseased offspring." He pointed out that, while the results of operation on non-hereditary congenital cataract were relatively favorable, the outcome tended to be much less satisfactory in hereditary cataract, where only about sixteen percent showed corrected vision of a sufficiently useful amount. Hereditary cataract is frequently complicated by the presence of other defects, such as microphthalmos, nystagmus, and amblyopia. Fleischer therefore argued that hereditary cataract was to be regarded as demanding action in accordance with the spirit of the German sterilization law, "to preserve the health of coming generations and therefore of the nation as a whole."

A number of well-known German ophthalmologists who took part in the discussion of Fleischer's paper did not hesitate to criticize his attitude as excessively radical. Engelking said em-

phatically that in order to save the law from being brought into bad repute, one could not advise strongly enough against such a proposal. The operative technique of the future is likely to be at least not inferior to that of today. No healthy person can be absolutely certain that his descendants will not show such a disorder as pigmentary degeneration of the retina, or any other hereditary defect. Engelking further reminded his audience that total color-blindness had been named among the disorders calling for sterilization, although it would obviously be undesirable to sterilize any completely color-blind person in the presence of full visual acuity.

As regards several conditions of supposedly hereditary character, it might take several generations to demonstrate heredity so clearly and to such a degree as to justify sterilization.

It has been argued that victims of hereditary cataract should be sterilized if they showed an unsatisfactory visual result after operation; it being reasoned that this could be taken as evidence against the probability of their begetting offspring free from disabling hereditary disease. But it must not be forgotten that a poor visual result after a cataract operation is sometimes due to unrecognized defects of operative technique. On the basis of this possibility, Clausen insisted that sterilization could only be justified if the vision remained very low after an operation as to whose technical perfection there could be no possible shadow of doubt.

Whatever individual judgments may be offered regarding the justice or expediency of the German law on this subject, the law is likely at least to stimulate the accumulation of valuable statistical knowledge. Lange (*Klinische Monatsblätter für Augenheilkunde*, 1938, volume 101, page 854), working under

Clausen, has gathered the records of all cases of retinal glioma handled in the Halle clinic, during the past 22 years, giving special attention to the question of heredity.

It has apparently been held necessary under the German law to report cases of retinal glioma and to submit the patients to sterilization. A number of professional voices have ventured to criticize this requirement. Stock, at Tübingen, could find no certain case of heredity among 28 glioma patients, while Reiser discovered only one unquestionable case of heredity among 16 such patients.

Lange's material includes a total of 35 cases, to which he adds an earlier case in the person of the father of two of the 35 recent subjects.

To the credit, perhaps, of absolute rulership, it is recorded that with the help of the post office department, of an official whose duty it is to keep memoranda with regard to those who live in each given community, and of the state public health official, questionnaires properly filled in were received concerning all the 36 patients! In a number of cases it was even possible to reexamine the patients and some of their relatives. Twenty, or 55.6 percent of the patients still survived, the longest interval being 22 years. The quoted figures of a number of other authors show a similar percentage of recoveries.

No bilateral case in the Halle clinic survived, except one child for whom the parents had refused enucleation eighteen months before the date of Lange's report. However, it must be remembered that bilateral enucleation is very seldom decided upon and hardly ever receives the consent of the parents.

Bilateral cases represented 30 percent of the Halle patients, as compared with an average of 25.7 percent in the literature of the subject as reviewed by Lange.

An attempt (perhaps statistically of questionable authenticity, in view of the fact that the first child is often the last child) was made to show that glioma is commoner among first-born than later-born children.

Lange is firmly convinced that glioma of the retina can be hereditary. Bilateral cases seem to occur rather more frequently in children one of whose parents has also had the disease. But there would be little purpose in sterilizing the unfortunate victims of bilateral glioma, for they have no opportunity to reach the age of reproduction.

Apart from religious scruples, there can be little question as to the right and propriety of sterilization for the protection of future generations. To determine the exact limits within which such a principle shall be put into practice is a much more difficult matter. It seems by no means impossible, moreover, that under an autocratic government the power of legalized sterilization might sooner or later be grievously abused.

W. H. Crisp.

PREVENTION OF BLINDNESS

Blindness is to be "partially or wholly deprived of sight." That is the definition from the dictionary. In popular use it means to be unable to do by sight what other people can do by seeing. The committee of the Section on Ophthalmology of the American Medical Association, which drew up a definition of the word, found that it was used with so many different meanings that it was necessary to recognize, by qualifying words, different kinds and degrees of blindness. Total absence of light perception is rare. The great mass of people who are rated as blind and are on relief rolls or in scientific statistics are those who have impaired vision, varying in the amount

of such impairment. In this sense the prevention of blindness is the prevention of impairment of vision.

The ophthalmologist confronted by anomaly, disease, or injury of an eye has to deal with a single problem of diagnosis and treatment. One who seeks to prevent blindness has a much broader problem, or association of broader problems, and various possibilities to consider. Prevention is better than cure, confers a greater benefit. But dealing with general prevention is a much broader, more difficult, and more permanent problem. Although in some cases a lasting or recurring disease, like trachoma or iritis, may need attention for years, prevention of blindness is always important for every one. The prevention of blindness needs thought, study, and determined action in many directions.

The first thing to be done is to bring about good lighting. The practice of calling night "blindman's holiday," recognizes that without light all are equally blind. The task of determining and teaching what is good lighting is a great duty, and a great opportunity for ophthalmologists. Next to it comes the duty of securing equal opportunities for children in the schools by testing the sight (and hearing) of each child who goes to school. When we can tell the teacher where each child must sit in order to see enough to read what he is expected to read, we will practice sight-saving and prevention of blindness, and the child will have a fair chance to do the school work expected of him. Correction of errors of refraction is a step in the prevention of blindness. But parents do not know when their children need such help. Teachers and school nurses can only guess at it. And, because of this ignorance, many children are condemned by the school system to remain ignorant.

They often become a public charge, because no effort has been made to prevent their ultimate blindness. Prevention of blindness is a live issue; something to be done for the scholar and for the taxpayer.

Edward Jackson.

A DIGEST OF CURRENT LITERATURE

The passing of the Ophthalmic Year Book some 10 years ago was an inestimable loss to the profession. The need of such a digest has continued to be felt keenly by all English writers on ophthalmological subjects. From time to time efforts have been made to find ways and means to revive it, but thus far without success. Recently, as evidence of the continued interest, committees were appointed from the national societies to confer on the subject.

The actual number of persons who are interested in full abstracts of all articles from the literature is relatively small, if one may judge by the subscription list of the Year Book while it was an independent publication. This never reached 500 names, but those who do want a complete digest are very urgent in the desire. Apparently they wish a reference book from which they can get complete abstracts of all articles that pertain to the subject about which they are seeking information, so that they will not be forced to go to the original sources, which are often difficult to obtain and frequently are written in a language unfamiliar to them.

In order to fill this need in so far as possible, this Journal has, since the discontinuance of the Year Book, enlarged the abstract department so that approximately 90 percent of the world's ophthalmic literature is abstracted in its columns. Of necessity many of these abstracts are condensed to the ultimate, all non-

essentials being culled out. This is satisfactory for those who wish merely to keep informed on matters of current interest but often does not give sufficient detail for one who wishes to use it as the only source for special information on a given subject. The only journal that has come near to fulfilling such an object has been the *Zentralblatt für die gesamte Ophthalmologie und ihre Grenzgebiete*, but this has been published in German, is very expensive, and not available to many even if they could translate the articles. Furthermore, it is doubtful that this journal will be continued, owing to recent changes in Germany.

Whether this latest effort on the part of our societies to provide some complete and full abstract journal or digest will succeed remains to be seen. The essential need is money. It is scarcely conceivable that there are enough potential subscribers to finance more than a part of it. The project is very expensive. A full-time editor, secretary, and a fairly large group of abstracters must be provided. Printing costs are high. Subscriptions probably would cover about one third of the undertaking, but this would leave some six to ten thousand dollars to be raised annually by other means. If one of the Foundations could be interested in the project sufficiently to endow it to the necessary extent, the plan might be put through. If financial backing can be found the mechanics of production can probably be arranged.

In the meantime this Journal will endeavor to cover the field in its abstract department as completely as possible.

Lawrence T. Post.

BOOK NOTICES

ANUARIO MEDICO-SOCIAL DE CUBA. Edited by Dr. Thomas R. Yanes. Cloth cover, 559 pages. Published under the auspices of the Re-

vista Cubana de Oto-Neuro-Oftalmiatria. Havana, Ucar, Garcia, y Cia, 1938. Price \$3.00.

The first edition of this excellent and enterprising publication was reviewed in the *Journal* a little over a year ago (1938, v. 21, p. 317). As mentioned at that time, the directory is unusual in the scope of its information, presenting particulars not only with regard to every Cuban physician but the full name of his wife and of each son and daughter, if any. The present volume differs from the preceding one chiefly in omission of introductory chapters dealing with prehistoric medicine in Cuba, the history of the University of Havana and its medical department, the history of medicine and surgery in Cuba, the history of the medical press in Cuba, Cuban medical associations and congresses, and the history of local hospitals and clinical institutions. A number of leading specialists are again caricatured in full-page drawings.

W. H. Crisp.

ESTRABISMO. By Jorge Malbran and Esteban Adrogué. Paper bound, 471 pages, with 122 figures. Published in Buenos Aires, by "El Ateneo," 1938.

In the preface to this scholarly volume the authors state they had two purposes in mind: The first was to bring the present knowledge of strabismus up to date, and the second to expound a new hypothesis about visual spatial sense.

The subject matter divides itself conveniently into two parts, one dealing with the normal physiology and the second with the aberrations, or pathology. In the physiological section, which takes up visual perception and projection, ocular movements, and fusion, for the most part

the ideas of recognized authorities are presented. Of these, Hoffman and Bierschowsky are most frequently quoted. The authors' own hypothesis about visual spatial sense attacks the concepts of innate retinal sensorial correspondence. Only 40 percent of their cases of strabismus showed "normal retinal correspondence." In the other 60 percent there existed an association of retinal points which was quite unlike that found in normal individuals. It is the authors' conviction that sensorial fusion is secondary to the optical projection into space of both eyes. Motor fusion is innate, and on this sensory fusion is built later.

The larger part of the book is devoted to the pathological section, which includes disturbances of muscular equilibrium, manifest strabismus, examination and apparatus, etiology, and treatment. The data are presented fully and in logical sequence. Proponents of various theories relative to controversial points are quoted and their opinions discussed. The authors' personal views correspond in general with the most widely accepted teachings in this country. One might take exception to a few statements, such as the assertion that all patients having monocular strabismus of high degree should be operated on by the age of three years. A welcome note of warning is sounded against relegating orthoptic training too much to technicians, without adequate supervision by the surgeon.

There is no alphabetical index, its place being taken by a table of contents with a summary of each chapter. A bibliography of 354 authors adds to the importance of this work and will greatly increase its usefulness.

Frederick A. Wies, M.D.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

ASSISTED BY DR. GEORGE A. FILMER

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

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| 1. General methods of diagnosis | 10. Retina and vitreous |
| 2. Therapeutics and operations | 11. Optic nerve and toxic amblyopias |
| 3. Physiologic optics, refraction, and color vision | 12. Visual tracts and centers |
| 4. Ocular movements | 13. Eyeball and orbit |
| 5. Conjunctiva | 14. Eyelids and lacrimal apparatus |
| 6. Cornea and sclera | 15. Tumors |
| 7. Uveal tract, sympathetic disease, and aqueous humor | 16. Injuries |
| 8. Glaucoma and ocular tension | 17. Systemic diseases and parasites |
| 9. Crystalline lens | 18. Hygiene, sociology, education, and history |
| | 19. Anatomy, embryology, and comparative ophthalmology |

7

UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Cassuto, Nathan. A bilateral iris malformation. *Boll. d'Ocul.*, 1938, v. 17, July, pp. 576-592.

A girl of seven years showed in the anterior chamber an iris-like membrane, attached posteriorly to the base of the iris and anteriorly to the posterior surface of the cornea. A discussion of the interpretation of similar anomalies is given, and the conclusion reached that this case was the result of an anomaly of development of the anterior chamber combined with a defect in the endothelial formation. (Bibliography, 4 figures.)
M. Lombardo.

Grandi, G. Contribution to the study of diabetic "rubeosis iridis." *Boll. d'Ocul.*, 1938, v. 17, June, pp. 484-491.

A man of 69 years affected by failing vision of both eyes for about a year showed two reddish spots at the infero-external sector of the sphincteric zone of the left pupil. By slitlamp these appeared to be formed by a capillary network from which three larger blood

vessels departed toward the iris base. In addition, other fundus lesions were present. The patient was found to have a hyperglycemia which dropped to within normal limits under proper diet. This case confirms the well-known fact that rubeosis iridis is a manifestation of diabetes and gives a bad prognosis for the eye. The writer opines that this vascular neoformation is related to increased blood pressure. (Bibliography.)
M. Lombardo.

Gullberg, J. E., Olmsted, J. M. D., and Wagman, I. H. Reciprocal action of constrictor and dilator pupillae during light adaptation. *Proc. Soc. Exper. Biol. and Med.*, 1938, v. 38, June, p. 616.

Measurements of pupillary size during various conditions of light adaptation were made by infrared photography. In the dark-adapted eye the pupil was smallest when the sympathetic nerves were cut, there being no equilibrium between the elasticity of the iris and the "residual tone" of the sphincter. The pupil was slightly larger when both the sympathetic and oculo-

motor nerves were cut. The pupil was next larger in the normal eye in dark adaptation. Maximal dilatation resulted when the oculomotor nerve was cut or atropine was instilled into the normal eye.

John C. Long.

Heath, P., and Geiter, C. W. Some physiologic and pharmacologic reactions of isolated iris muscles. *Arch. of Ophth.*, 1939, v. 21, Jan., pp. 35-44.

A new autographic method was used for the experimental study of the reactions of isolated iris muscle of the rabbit and dog. Both physiologic and pharmacologic stimulators and depressors were employed. This delicate method showed physiologic tissue response and permitted pharmacologic instead of toxic reactions. An irregular spontaneous rhythm was found in the relaxed muscle. The smooth iris muscle had qualities in general like those of other smooth muscles. It is concluded that the sphincter and dilator do not oppose one another's action but coöperate, and that the total work power of the dilators is greater than that of the sphincters. The ion reactions as found by Poos were duplicated. The sphincter reacted to parasympathetic stimulators but these had no effect on the relaxed dilator. The dilator fibers reacted to sympathetic stimulators. Atropine and its group relaxed the sphincter and also relaxed the dilator. An increase of tonus was accomplished by cooling, alkalization, and mechanical stimulation; and a decrease by acidification, heat, previous disease, and age of tissue.

J. Hewitt Judd.

Osterberg, G. Iritis Boeck (sarcoid of Boeck in iris). *Brit. Jour. Ophth.*, 1939, v. 23, March, pp. 145-160.

Boeck's supposition advanced in 1899 that dermal sarcoid might affect other tissues beside the skin has been

confirmed in the literature since that time. The reviews and findings of Waldenström, Schaumann, Pautrier, Oberling, and others are cited to this effect. Boeck's disease has been found to occur in the lacrimal glands, salivary glands, epididymis, mamma, cardiac muscle, and mucous membrane of the lacrimal duct. Four or five cases have been reported where patients having the disease died of cardiac debility. As for the eye, the disease involves the conjunctiva, cornea, iris, choroid, and optic nerve. Iritis is said to be quite common among those having Boeck's disease, there being five cases of iritis noted out of twenty afflicted with Boeck's. Regardless of difference of viewpoints, authors agree that clinically iritis Boeck closely resembles tuberculous iritis. (Tables, figures, references.)

D. F. Harbridge.

Robertson, J. D. The chemical equilibrium of the interstitial fluids and the aqueous humor. *Brit. Jour. Ophth.*, 1939, v. 23, March, pp. 170-190.

The author limits his discussion, not suitable for abstract, to the aspects of the chemical equilibrium that exists between (1) blood and lymph, (2) blood and gastric juice, and (3) blood and aqueous humor. Each of these three classifications is fully discussed, the author concluding that the aqueous humor cannot be considered as a simple, protein-free ultrafiltrate or dialysate of blood plasma, but that it is a specialized fluid manufactured for a specific purpose. (Figures, references.)

D. F. Harbridge.

Robertson, J. D. The theories on the formation of the aqueous humor. *Brit. Jour. Ophth.*, 1939, v. 23, April, pp. 243-250.

The controversial subject of the theories regarding the formation of the

aqueous is presented. The author discusses the crystalloids and colloids and the permeability of the membranes as a preliminary to the definitions advanced for dialysate, ultrafiltrate, exudate, transudate, and secretion before going into the theories of the subject itself. These definitions are considered and explained in full, it being the conclusion of the author that the aqueous humor is produced by secretion as based on physiological facts rather than on generally accepted data as to anatomy of the ciliary processes, functional activity, electrical evidence, and so on. (References.) D. F. Harbridge.

Seager, L. D. Effect of potassium chloride on the normal and denervated iris. *Proc. Soc. Exper. Biol. and Med.*, 1938, v. 38, June, p. 629.

Camp and Higgins have advanced the hypothesis that epinephrine acts by liberating potassium. Seager found that potassium chloride constricts the pupil of intact and excised eyes of frogs and the normal and sympathectomized iris of rabbits. Epinephrine overcame this constriction even when the dosages of potassium were excessive. These observations do not support the hypothesis that epinephrine acts by liberating potassium. John C. Long.

Sveinsson, Kr. Choroiditis areata. *Acta Ophth.*, 1939, v. 17, pt. 1, p. 73.

This phenomenon represents a congenital disturbance in the development of the pigment epithelium and the choroid; it is bilateral and symmetrical, and without any tendency to involve the macula. The fundus picture is that of a circumpapillary choroidal atrophy, extending in radial bands toward the periphery; the atrophic areas, which expose the sclera, are sharply demarcated. Four cases are described in detail. Ray K. Daily.

GLAUCOMA AND OCULAR TENSION

Alvis, B. Y. Management of glaucoma following cataract operation. *Amer. Jour. Ophth.*, 1939, v. 22, May, pp. 518-525.

Barkan, Otto. An operative procedure for glaucoma of shallow-chamber type; multiple excisions of the root of the iris and deepening of the anterior chamber. *Arch. of Ophth.*, 1939, v. 21, Feb., pp. 331-345; also *Trans. Sec. on Ophth.*, *Amer. Med. Assoc.*, 1938, 89th mtg., p. 284.

The mechanical etiology of the shallow-chamber type of primary glaucoma is discussed, together with the technical difficulties and inadequacies of iridectomy. The operation described appears to solve the technical difficulties and dangers of operating in this type of glaucoma. The anterior chamber is deepened by injection of physiologic salt solution or Ringer's solution into the anterior chamber after a posterior sclerotomy or the extraction of vitreous with a Zur Nedden needle. Multiple peripheral iridectomies, usually three, are made through beveled keratome incisions. This type of incision closes in the manner of a valve and allows restoring, maintaining, and deepening of the anterior chamber as often as necessary. There is no marked cosmetic disfigurement, and no appreciable refractive error is caused. The sphincter of the pupil is preserved. Postoperative adhesions at the filtration angle are prevented. The author has used this procedure in fifteen cases, and it promises to answer the purpose of an early or prophylactic operation in this type of glaucoma to avoid the dangers of iritis, late infection, cataract formation, and of a malignant course. Since the postoperative use of miotics

is sometimes necessary, it is not applicable for those patients who are not easily controlled or who cannot report for periodic examination.

J. Hewitt Judd.

Bencini, Alberto. Holth's iridencleisis and chronic glaucoma. *Boll. d'Ocul.*, 1938, v. 17, June, pp. 421-443.

The writer mentions the different surgical methods used in chronic simple and chronic inflammatory glaucoma, discussing their advantages and disadvantages. Due to the fact that even the classical Elliot and Lagrange operations may end in disaster, he recently has resorted to iridencleisis with apparently satisfactory results. He reports five patients between 32 and 69 years of age, who had maintained tensions within normal limits for several months following this operation. (10 figures.) M. Lombardo.

Fantl. Our experience with Lindner's vitreous fistula operation. *Acta Ophth.*, 1939, v. 17, pt. 1, p. 1.

This detailed analysis of 50 operations on 47 eyes shows that the initial hypotony immediately after the operation is followed by a recurrence of hypertension, and a second operation has to be performed. The operation is thus useful only as a preliminary procedure to reduce intraocular tension in cases in which it is extremely high, or to produce a deep anterior chamber in cases in which it is obliterated. The operation was performed without effect in one case of retinal embolism and in two cases of optic atrophy.

Ray K. Daily.

Fradkin, M. I., Levina, L. C., Stein, F. G., and Shubova, T. B. Glaucoma and the vegetative nervous system. *Viestnik Opht.*, 1939, v. 14, pt. 1, p. 3.

The authors attribute the physico-

chemical and vascular disturbances in glaucoma to a disturbance in the central portion of the vegetative nervous system. They support this contention by the presence of a wide vegetative asymmetry in unilateral glaucoma. The vegetative functions studied in this investigation were the albumen content of experimental cantharides blisters, the water-absorption rate, and the dermographic test. In 21 patients with unilateral glaucoma the response to these tests was asymmetrical on the two sides of the body. A study of the water and the sugar metabolism also indicates a severe disturbance in the central vegetative nervous system. The authors assume that these disturbances are a factor in the etiology of glaucoma.

Ray K. Daily.

Green, A. S., and Green, M. I. Automatic trephine for glaucoma. *Arch. of Ophth.*, 1939, v. 21, Feb., pp. 328-330.

The authors discuss the proper technique in the use of their automatic trephine, pointing out that it permits easy manipulation without excessive trauma. They state that its use over a period of ten years has reduced the percentage of complications, resulted in more operative cures, and decreased the period of hospitalization.

J. Hewitt Judd.

Lauber, Hans. The relationship between intracranial and retinal blood pressure and intraocular tension; the treatment of tabetic optic atrophy. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 2, p. 661. (See Section 11, Optic nerve and toxic amblyopias.)

Lloyd, J. P. F. Some experiences of the use of diathermy in increased intraocular tension. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 2, p. 774.

A discussion of the benefit of high-frequency current in reducing intraocular tension is given. The machine used delivers 600 ma. at approximately 600 kc. The current is passed until the patient gets a sensation of warmth in the eye; this is the only control. The least increase above the comfortably warm stage may burn the skin. (10 case reports.) Beulah Cushman.

Medvedjev, H. I., and Satz, L. B. The effect of retrobulbar injection on the ocular tonus. *Viestnik Opht.*, 1939, v. 14, pts. 2-3, p. 102.

A tabulated report of thirty clinical cases and the protocols of tests on rabbits. As a result the author questions the validity of Liberman's dictum that there are no contraindications to retrobulbar injections; in some cases of glaucoma an injection of novocaine and adrenalin produced a further rise in intraocular tension. Ray K. Daily.

Miller, E. A. The treatment of glaucoma with splenic extract. *Amer. Jour. Ophth.*, 1939, v. 22, May, pp. 536-540.

Möller, H. U. Symptoms simulating glaucoma in a case of Blumenbach's chordoma. *Acta Ophth.*, 1939, v. 17, pt. 1, p. 20.

A report of a case in a 49-year-old woman, with excavation of the optic papillae, bilateral Bjerrum scotomata, and normal intraocular tension, produced by a chordoma of the sella turcica. This case supports Traquair's contention that a Bjerrum scotoma and excavation of the optic disc are not pathognomonic for glaucoma. In this case, at operation the optic nerves were found flattened; the excavation of the papillae can be explained by the pressure of the tumor on the prechiasmal portion of the nerves. The scotomata, the author believes, might be due to an

arrangement of the nerve fibers at the edge of the papilla similar to that in glaucoma. (Illustrations.)

Ray K. Daily.

Przibilskaia, I. I. Daily fluctuations in dark adaptation in glaucoma. *Viestnik Opht.*, 1939, v. 14, pts. 2-3, p. 37.

The author urges more frequent dark-adaptation tests in the morning and in the evening as a diagnostic procedure in early glaucoma and as a check on the effectiveness of surgical procedures. In frank glaucoma the difference between the morning and evening curves is very pronounced; at times the threshold of perception in the morning is ten times higher than in the evening. In early cases the difference is from two to four times. The test is applicable in cases with normal daily intraocular tension, in early postoperative cases where instrumentation is undesirable, and in cases with distorted cornea where tonometric findings are unreliable. Ray K. Daily.

Rachevskii, F. A. The role of the vitreous in the pathogenesis of glaucoma. *Viestnik Opht.*, 1939, v. 14, pts. 2-4, p. 42.

A review of the literature.

Ray K. Daily.

Rosovskaja, S. B. The significance of elastotonometry in the diagnosis of glaucoma. *Viestnik Opht.*, 1939, v. 14, pt. 1, p. 9.

This investigation deals with the effect of surgery and miotics on the elastotonometric curve. The conclusions are that this curve is an expression of the reflex which regulates intraocular tension, and its slightest disturbance reacts on the form and height of this curve. Elastotonometric studies are valuable in the diagnosis of glaucoma,

particularly in its early and prodromal stages; they are especially valuable because they indicate glaucomatous changes even though the intraocular tension be normal. This test can serve to check the effectiveness of new drugs and surgical procedures; if effective the curve returns to normal. Comparative studies of elastotonometric and daily tension curves show complete agreement of data, regardless of the stage and type of glaucoma.

Ray K. Daily.

Zaionchkovskii, M. I. The influence of barometric pressure and humidity on the blood pressure and intraocular tension of glaucoma patients. *Viestnik Ophth.*, 1939, v. 14, pt. 1, p. 106.

Studies on fifty patients indicate that increased humidity acts unfavorably on glaucoma, particularly on the acute inflammatory type. There is no such relation demonstrable between glaucoma and the barometric pressure.

Ray K. Daily.

9

CRYSTALLINE LENS

Alvis, B. Y. Management of glaucoma following cataract operation. *Amer. Jour. Ophth.*, 1939, v. 22, May, pp. 518-525.

Barsoum, Labib. A case of congenital cyst in anterior chamber of left eye with congenital anterior capsular cataract in both eyes. *Bull. Ophth. Soc. Egypt*, 1937, v. 30, p. 195. (See Section 7, Uveal tract, sympathetic disease, and aqueous humor.)

Bonnet, P., and Grandclément, E. Postoperative detachment of the choroid (after total cataract extraction). *Arch. d'Ophth. etc.*, 1939, v. 3, Jan., p. 1.

Until about the year 1900, detach-

ment of the choroid was recognized as a complication especially of glaucoma operations. We owe to E. Fuchs revelation of the relative frequency of detachment of the choroid after cataract operation. He discussed the existence of small detachments sometimes latent, which only a systematic ophthalmic examination would uncover. From his first communication in 1900, Fuchs pronounced the prognosis to be favorable. The authors report six cases of choroidal detachment following cataract operation, and which after a variable interval became completely replaced. It is very difficult to give an idea, even approximate, of the relative frequency of postoperative detachment of the choroid. It is probable that a certain number of cases escape observation.

Only six cases of detached choroid were encountered in a total of 1,400 extractions practised at the Ophthalmologic Clinic (the only ones the authors had been able to study systematically when they left the hospital). This is approximately 0.5 percent. The percentage given by Fuchs was 4.7. Hagen gave 22 percent. The operative technique plays no part in production of the condition. Anatomic conditions of the eye itself appear to play the main rôle. Hypertonicity of the globe is of first importance. The opening of the anterior chamber quickly lowers intraocular tension. Alterations of the uveal tract, especially those seen in diabetes, play an important part. Resistance of the zonule may be the cause in certain cases. After the detachment returns to its place one may see plaques of atrophy of the choroid and pigment streaks of the retina. (Color plates, illustrations.)

Derrick Vail.

Buxton, Robert. The intracapsular extraction of cataract with forceps.

Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 2, p. 742.

A comparison is made of the complications, as found in the literature, following intracapsular and extracapsular extractions, such as ruptured capsule, vitreous prolapse, and detachment of the retina. The choice of the case for intracapsular operation as to type and age of patient, local disease, exophthalmos, and shallow anterior chamber is discussed; and the kind of operation for the various types of cataract is discussed with details of technique. Beulah Cushman.

Clarke, C. C. Ectopia lentis; a pathologic and clinical study. Arch. of Ophth., 1939, v. 21, Jan., pp. 124-153.

This article is based on a review of the literature, a study of 71 globes, and an analysis of 31 case histories. The following anatomic classification is proposed to clarify the clinical study of this condition: grade 1, simple ectopia lentis; grade 2, ectopia lentis combined with anomalies of ocular dimension; grade 3, ectopia lentis combined with anomalies of ocular structure; grade 4, ectopia lentis combined with anomalies of constitution, that is aberrancies of body development. The pathogenesis of ectopia lentis is not understood because of many conflicting theories of etiology. Amblyopia is frequently present and there is a high incidence of strabismus. Phakic refraction nearly always shows myopia. With aphakic refraction, relative myopia is less frequent, but more common than hyperopia. This would indicate that a good deal of the myopia in cases of ectopia lentis is lenticular rather than axial. Loop extraction following a wide preliminary iridectomy offers the best solution to this problem, as the ultimate prognosis for untreated eyes is bad.

Discussions and operations on the iris are usually unsatisfactory. (Extensive bibliography.) J. Hewitt Judd.

Cosmettatos, G. F. Intracapsular cataract extraction. Ann. d'Ocul., 1939, v. 176, Feb., pp. 127-131.

Intracapsular extraction with peripheral iridectomy is recommended as the operation giving the most satisfactory result. Using Arruga or Kalt forceps, the author was able to deliver 38 percent of 585 cataracts without breaking the capsule. Complications were no more frequent than with the extracapsular method.

John M. McLean.

Dimitry, T. J. The dislodging force utilized in intracapsular cataract extraction. Amer. Jour. Ophth., 1939, v. 22, April, pp. 416-418.

Dimitry, T. J. Evolution of a sucking disc for intracapsular extraction of cataract. Arch. of Ophth., 1939, v. 21, Feb., pp. 261-265.

A hollow needle one inch long, with an enlarged sucking disc 4 mm. in diameter on its distal end, is fitted to an accurately ground glass 2-c.c. syringe with a resisting power of seventy pounds of hydraulic pressure. The spring plunger is five sixths the length of the barrel so that the actual displacement is only equal to the amount of air contained in the sucker and the lumen of the needle. Thus when the disc is applied to the lens and the plunger released, the lens adheres because of atmospheric pressure. By varying the pressure of the thumb on the rod, different degrees of tension on the capsule can be produced, and the grip can be changed readily from one part of the capsule to another. If desired, vibration of the capsule can be pro-

duced by merely pressing and releasing the plunger of the instrument. There is no valve. (Photographs.)

J. Hewitt Judd.

Dutt, K. C. **Role of nonviolence in lever-action intracapsular extraction of cataract.** Arch. of Ophth., 1939, v. 21, Jan., pp. 8-29.

This article is a sequel to one previously published in which the scientific principle of the lever action and its technical application to the intracapsular extraction of cataract were described (Amer. Jour. Ophth., 1938, v. 21, p. 707). The stages in the operation are reviewed and an explanation is offered as to why the author considers his method safer, surer, and at the same time simpler than capsulotomy and the other intracapsular methods. This operation allows the principle of nonviolence to be applied to the rotation of even the most stubborn lens with a hyalonavicular fulcrum and a mango-leaf dislocator. J. Hewitt Judd.

Eckardt, R. E., and Johnson, L. V. **Nutritional cataract and relation of galactose to appearance of senile suture line in rats.** Arch. of Ophth., 1939, v. 21, Feb., pp. 315-327.

The production of cataract in albino rats when placed on a diet deficient in riboflavin (vitamin G, or B₂) was obtained in only two out of 23 rats. Inclusion of riboflavin in the diet did not prevent the cataract from progressing to maturity and in one instance did not prevent a cataract from forming in the second eye. The cataract started as an opacity of the fetal nucleus. Keratitis and vascularization of the cornea were more consistent ocular changes than cataract and were improved by addition of riboflavin to the diet; they did not occur in animals kept on the Day diet supplemented with riboflavin. A

diet high in lactose produced a senile suture pattern in three weeks in each instance. This was accompanied by peripheral vacuoles as well as by club-shaped riders similar to those seen in coronary cataracts. The senile suture pattern was not observed in any of the rats on the lactose-free diet. When mature cataract appeared, it started as an opacity in the fetal nucleus. Lactose in the diet or injection of galactose caused rapid maturation of the lens as evidenced by the appearance of the senile suture line. Vascularization of the cornea was never observed in the rats on the diet high in lactose.

J. Hewitt Judd.

Euler, H., Hellström, H., Schlenk, F., and Günther, G. **The enzyme system of oxydo-reduction metabolism in lenses.** Graefe's Arch., 1939, v. 140, pt. 1, pp. 116-128.

In the examined lenses (cattle, rats) the oxidation-catalyzers, cytochrome, cytochrome c-oxydase, and diaphorase are absent. Yellow ferment, even if predominantly present, may not play any role as a carrier of hydrogen in the lens. Among the dehydrogenases, succinodehydrogenase is absent. A greater number of cozymase (diphospho-pyridine nucleotide) combined dehydrogenases are identified. In addition, one finds the triphospho-pyridine nucleotide specific dehydrogenase of the hexose monophosphoric acid. The examined lenses are rich in cozymase and also contain triphospho-pyridine nucleotide; cozymase is present in an oxidized and a reduced form. There is thus found in lenses all the necessary enzymatic components for glycolysis, while the respiratory system is imperfect. As has been known for a long time, lenses contain much ascorbic acid and much sulphhydryl combina-

tions which come under consideration as activators, that is as co-enzymes of a still unknown enzyme system of oxydation-reduction. For the opinion that ascorbic acid in the lens is derived from hexoses, a point of support is experimentally obtained. H. D. Lamb.

Fahmy, A. Y. Experience with the erisiphake of Barraquer. *Bull. Ophth. Soc. Egypt.* 1937, v. 30, p. 101.

Preoperative preparations are outlined in detail and the technique of Barraquer's operation is given.

Edna M. Reynolds.

Fischer, F. P. Aneurin (vitamin B) in the lens. *Ophthalmologica*, 1939, v. 96, Jan.-Feb., p. 219.

Vitamin B is present in the lens almost exclusively as co-carboxylase which is effective as a ferment rather than as a vitamin. It causes the decomposition of pyruvic acid. An accumulation of the latter characterizes progressive opacification of the lens and explains the paucity of lactic acid in the cataractous lens.

F. Herbert Haessler.

Fradkin, M. I. Hemato-ophthalmic barrier in newborn animals. *Viestnik Ophth.*, 1939, v. 14, pts. 2-3, p. 100.

Experiments on rabbits show that animals attain the normal hemato-ophthalmic barrier after their ninth day. This explains the fact that the progeny of scorbutic guinea pigs are born with lenticular opacities, while to produce cataract in scorbutic animals a disturbance in the hemato-ophthalmic barrier must first be produced.

Ray K. Daily.

Gifford, S. R., and Bellows, J. Histologic changes in the lens produced by galactose. *Arch. of Ophth.*, 1939, v. 21, Feb., pp. 346-358.

Lenses were removed from white rats, which had been placed on a diet of 50 percent galactose, one to 32 days after the beginning of the diet. The lenses showed various stages of galactose cataract. These were compared with a series of lenses with naphthalin cataract and a few lenses with senile cataract. Histologic changes were found in lenses which appeared normal in vivo. In galactose cataract the earliest changes involved the cortical fibers near the equator, but growth of new fibers was sufficiently rapid that some relatively normal fibers were always found just beneath the capsule in this region. The capsular epithelium showed changes later. The nucleus remained undamaged to a late stage. Regeneration of new fibers occurred rapidly when a normal diet was resumed. In naphthalin cataract the capsular epithelium and peripheral cortex were involved simultaneously. Rapid swelling of the lens occurred. The nucleus remained intact to a late stage.

J. Hewitt Judd.

Horváth, Béla de. Cataract extraction with scleral suture. *Szemészet*, 1938, v. 1, Dec., p. 22.

Having dissected the conjunctiva from the limbus up to the insertion of the superior rectus muscle, the author grasps the tendon of this muscle and inserts a needle from above downward between the fibers of the tendon and of the scleral tissue, so that the point of the needle shall emerge 4 mm. in front of the corneal margin. He makes the corneal section in the usual way, but at 3 mm. distance from the limbus turns the knife at an angle so as to cut a scleral flap. The lens is extracted in the usual way, and then the sutures are inserted into the scleral flap and the wound is closed. The author claims

superiority of this method in preventing opening of the wound and also iris prolapse. Out of 51 operations performed in this way, iris prolapse occurred in two instances only, these being cases in which catgut was used instead of hair as suture material.

R. Grunfeld.

Kopp, I. Intracapsular cataract extraction. *Viestnik Ophth.*, 1939, v. 14, pt. 1, p. 79.

An analysis of 120 operations leads to the following conclusions: (1) The operation is indicated in immature, nuclear, and myopic cataract. (2) Extraction with iridectomy and without tumbling of the lens is preferable. (3) The operation is not free from postoperative complications such as hyphemia, iritis, late restoration of the anterior chamber, and excessive astigmatism.

Ray K. Daily.

Lénárd, Imre. Suture for wound closure in cataract extraction. *Szemészet*, 1938, v. 1, Dec., p. 29.

After dissecting the conjunctival flap and undermining it for a distance, the author makes a cut parallel with the limbus through the superficial layers of the sclera. He undermines this incision toward the cornea and toward the sclera. A perpendicular cut makes the flaps mobile, so that they can be grasped with forceps without traumatizing the parenchyma proper. They are united by mattress sutures after the extraction, which the author performs without iridectomy.

R. Grunfeld.

Liebermann, Leo de. Conjunctival suture in cataract extraction. *Szemészet*, 1938, v. 1, Dec., p. 46.

The author enumerates a few technical details which he used with great advantage in cataract extractions with

conjunctival flap after the method of Blaskovics.

R. Grunfeld.

Lindberg, J. G. Eight cases of dinitrophenol cataract, two of which had punctate stationary lenticular opacities, not described hitherto. *Acta Ophth.*, 1938, v. 16, pt. 4, p. 556.

In addition to six cases of typical dinitrophenol cataract, the author describes two cases with stationary lenticular opacities at the equator, without impairment of vision.

Ray K. Daily.

Mählen, Sven. Dinitrophenol cataract. *Acta Ophth.*, 1938, v. 16, pt. 4, p. 563.

A review of the literature and a report of seven cases.

Ray K. Daily.

Müller, H. K. The carbohydrate metabolism of the lens in acute naphthalin poisoning. *Graefes Arch.*, 1939, v. 140, pt. 1, pp. 171-190.

In acute naphthalin poisoning, the sugar content of the lens diminishes. This does not result from a diminution of sugar in the aqueous humor, but from disturbances of intermediate sugar metabolism in the lens and from the difficulty with which sugar enters the lens. The naphthalin poisoning causes considerable increase of the lactic acid in the lens, blood, and aqueous humor. Indications exist that the release of sugar, glutathione, and ascorbic acid also becomes more difficult.

H. D. Lamb.

Oberhoff, Kurt. Congenital cataract with formation of crystals. *Klin. M. f. Augenh.*, 1939, v. 102, Feb., p. 238.

A machinist aged 29 years presented a very rare congenital, dominantly hereditary, bilateral cataract with conical and nodular amorphous opacities containing crystals, which had no rela-

tion to the anatomic structure of the lens. The patient had had poor sight since early life. A sister who had died from tuberculosis at the age of seventeen years had shown at the age of ten years glistening opacities in both lenses, probably of the same type.

C. Zimmermann.

Reis, Julian. The significance of ascorbic acid in the chemical metabolism of the lens. *Klinika Oczna*, 1938, v. 16, pt. 6, p. 760.

A review of the literature.

Ray K. Daily.

Salit, P. W. Nitrogen content of cataractous and sclerosed human lenses. *Acta Ophth.*, 1939, v. 17, pt. 1, p. 81.

The analysis of 167 cataractous and sclerosed human lenses shows that there is a considerable loss in protein in the senile pathologic lens, and that the loss is proportionate to the degree of pathology in the lens. The loss involves chiefly the soluble crystallins; the insoluble albuminoids left behind impart to the nucleus, in which they predominate, an increased rigidity and hardness.

Ray K. Daily.

Salit, P. W. The reaction and buffer activity of normal ox lenses. *Amer. Jour. Ophth.*, 1939, v. 22, April, pp. 413-415.

Sédan, Jean. Equatorial trepanation of the sclera as a prophylactic for expulsive hemorrhage. *Ophthalmologica*, 1939, v. 96, Jan.-Feb., p. 201.

In two patients, in each of whom one eye had been lost from expulsive hemorrhage, the second eye was successfully operated upon for cataract. In these eyes a preliminary equatorial trepanation was done two weeks before cataract extraction. Despite copious

hemorrhage from the subconjunctival injections of novocaine for anesthesia before trepanation, no expulsive hemorrhage occurred when the eye was opened two weeks later. Sédan prefers this procedure to posterior sclerotomy immediately before cataract extraction.

F. Herbert Haessler.

Sédan, Jean. Two cases of dinitrophenol cataract. *Ann. d'Ocul.*, 1939, v. 176, March, pp. 191-197.

Two typical cases of rapidly developing dinitrophenol cataract are reported.

John M. McLean.

Szily, Aurel. The Doyme Memorial Lecture. The contribution of pathological examinations to the elucidation of the problems of cataract. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 2, pp. 595-660.

The author gives an extensive histologic report on his study as to the development of cataract. As to the morphologic basis of certain malformations of the lens, fundamental importance resides in the proof that divergence from normal morphology is primary and disintegration of the lens substance secondary in all cases of genuine idiokinetic malformation of the lens. Biochemistry has revealed that the first stimulus to cataractous change is initiated by chemical processes within the lens itself. (Illustrations.)

Beulah Cushman.

Szymanski, Janusz. The application of the Smith and Pagenstecher principles to subconjunctival extraction of the lens. *Klinika Oczna*, 1938, v. 16, pt. 6, p. 752.

The technique consists in section with conjunctival bridge, introduction of sutures on each side of the bridge, pressure with a hook according to

Smith from below and with a Weber loop introduced under the bridge from above, and introduction of the loop behind the cataract as soon as its upper border presents. (Illustrations.)

Ray K. Daily.

Van Lint. **Extraction of secondary cataract after double incision of the cornea.** *Bull. Soc. Franç. d'Opht.*, 1938, v. 51, pp. 463-467. (See *Amer. Jour. Ophth.*, 1939, v. 22, Feb., p. 230.)

Vila Ortiz. **Experimental action of galactose on the lens of the dog.** *Arch. de Oft. de Buenos Aires*, 1938, v. 13, Sept., p. 467.

This article is an experimental study on the calcium content of the lens of the dog with respect to the effect of the administration of galactose. The essayist concludes that the calcium content of the lens of the dog is extremely variable. Galactose administered by intraocular or intravenous injection has no appreciable effect upon the calcium content of dogs' lenses. Oral administration of galactose, however, produces significant changes. The calcemia produced by oral administration of galactose varies between figures which can be considered normal. There are no histopathologic changes in the parathyroid glands of animals which have ingested galactose.

Edward P. Burch.

Wagner, H. **Remarks on Bakker's criticism regarding the question of the infrared cataract.** *Graefe's Arch.*, 1939, v. 140, pt. 1, pp. 191-192.

The author criticizes the contention of Bakker (see *Amer. Jour. Ophth.*, 1939, v. 22, p. 462) following the similar previous one of Goldmann, that there exists a heat cataract rather than an infrared cataract, as Vogt's clinic

claims. He indicates that neither Goldmann nor Bakker had carefully read the results reported from Vogt's clinic. In addition, Goldmann himself had stated that his argument failed in that lens opacities occurred in albino rabbits after infrared radiation. Vogt's assistants have been able to produce thick posterior shell cataracts in albino rabbits with penetrating infrared rays.

H. D. Lamb.

10

RETINA AND VITREOUS

Abramowicz, I. **Marking of perimetrically determined corneal meridians.** *Klinika Oczna*, 1938, v. 16, pt. 6, p. 758.

A device which consists of a white disc with a movable pointer attached at the center. (Illustration.)

Ray K. Daily.

Agatston, S. A. **Report of two cases of unilateral retinitis pigmentosa.** *Amer. Jour. Ophth.*, 1939, v. 22, April, pp. 420-421.

Anker, Morten. **Three cases of tuberculous cerebral sclerosis with Van der Hoeve's phacoma retinae.** *Acta Ophth.*, 1938, v. 16, pt. 4, p. 454.

A review of the literature and detailed case reports. The eye symptoms in the author's cases comprised veiling of the papilla, white stripes along the retinal vessels, raspberry-like white tumors, and small flat slightly projecting white foci in addition to the usual choroidal atrophic areas. Because idiocy and epilepsy are frequent symptoms of tuberculous sclerosis, the author urges ophthalmoscopic examination of idiots and epileptics; and because retinal phacomata may be the only symptom of cerebral sclerosis he advises ophthal-

moscopic study of the entire family of a patient with cerebral sclerosis. (Illustrations.) Ray K. Daily.

Bogdanovich, I. I. Hole detachment of the vitreous. *Viestnik Opht.*, 1939, v. 14, pts. 2-3, p. 52.

A review of the literature, and a report of four cases. In the two cases which the author was able to observe for some time retinal detachment did not occur. (Illustration.)

Ray K. Daily.

Bonnet, Paul. Angioid streaks of the retina, etc. etc. *Bull. Soc. Franç. d'Opht.*, 1938, v. 5, pp. 516-520.

Pictures of the fundi of two eyes are described, in which there were angioid streaks, macular degeneration, pigment disturbance, and choroidal atrophy, in a patient with pseudoxanthoma of the skin.

Clarence W. Rainey.

Bonnet, P., Dechaume, J., and Blanc, E. Cirroid aneurysm of the retina, its relation to cirroid aneurysm of the face and cerebellum. *Bull. Soc. Franç. d'Opht.*, 1938, v. 51, pp. 521-524.

Pictures of two fundi are reproduced, showing aneurysm of the retinal vessels. The authors recommend that aneurysm elsewhere be searched for by neurologic examination and X ray, in all cases accidentally encountered by ophthalmoscopic examination.

Clarence W. Rainey.

Bozzoli. A simple method for the localization of the tear in retinal detachment. *Boll. d'Ocul.*, 1938, v. 17, Aug., pp. 683-684.

The method is based on the fact that the combination of two complementary lights gives a white light. While the examiner explores the fundus with an ophthalmoscope furnished with red

light, an assistant transilluminates the sclera with a green light. The exact place of the tear is determined where the white light manifests itself.

M. Lombardo.

Cassady, J. V. Congenital cyst of the vitreous. *Arch. of Ophth.*, 1939, v. 21, Jan., pp. 45-50.

The author reviews the literature and reports the case of a young lady aged 25 years, in whom a cyst in the vitreous was discovered accidentally. The presence of a prepapillary membrane, the lack of pigment, and the location of the cyst in the center of the vitreous suggest the primary vitreous as the site of origin of the cyst as opposed to the theory previously advanced, that such cysts probably originate from a degenerative adenomatous cyst of the ciliary processes. The cyst is shown in a fundus photograph and a colored plate. J. Hewitt Judd.

Cassuto, Nathan. The behavior of the retinal arterial pressure after bloodletting. *Boll. d'Ocul.*, 1938, v. 17, Aug., pp. 635-644.

The general and retinal blood pressures were tested in nine patients before and after bloodletting with the idea of finding whether a mechanism regulating the cephalic arterial pressure exists. It was found that both general and retinal diastolic pressures fell, but that there was no direct relation between the two amounts of fall. No uniform values were obtained relating the systolic and diastolic general and retinal pressures to the withdrawal of blood, and no separate mechanism for regulating the cephalic arterial pressure was found, the pressure here merely following the behavior of the general pressure. (Bibliography.)

M. Lombardo.

Coppez, H., and Fritz, A. Some remarks upon thrombosis of the central vein of the retina. *Bull. Soc. Franç. d'Opht.*, 1938, v. 51, pp. 525-530.

In this communication the authors give a concrete demonstration of the important clinical data which must be gathered to utilize their plan of examination of a patient with thrombosis of the retinal vein. Examinations of blood pressure and of arterial and venous pressures in the eye by the method of Bailliant are the basis of the authors' argument. An idea of the proper therapeutic methods is thereby gained.

Clarence W. Rainey.

Cusick, P. L., and Herrell, W. E. Retinal arteriolar changes as part of an induced general vasospastic reaction; effect of tobacco and cold. *Arch. of Ophth.*, 1939, v. 21, Jan., pp. 111-117.

A reduction in the caliber of the retinal arterioles was found after smoking in five patients with an idiosyncrasy to tobacco and in 20 out of 25 patients undergoing the cold pressor test. An average rise in intraocular tension of 2 mm. of mercury was noted for the patients who showed a vasospastic reaction from smoking. The narrowing of the caliber is apparently uniform throughout the course of any individual arteriole but is not present equally in all arterioles. The character of the narrowing suggests that it is due to increased vasomotor tonus rather than to active angiospasm. The almost constant association of a transitory reduction in caliber of the retinal arterioles with a rise in systemic blood pressure accompanying the general vasopressor action of cold and tobacco suggests that the generalized narrowing of the retinal arterioles observed ophthalmoscopically in many cases of hypertensive disease is due primarily to active vasocon-

striction or increased vasomotor tonus rather than to actual structural change in the walls of the vessels.

J. Hewitt Judd.

Franceschetti, M. A. Myelinated retinal fibers and disorders of the head. *Bull. Soc. Franç. d'Opht.*, 1938, v. 51, pp. 573-577.

The authors think that myelinated retinal-nerve fibers indicate a pathologic constitutional state affecting the central nervous system, and they would place the condition in a group containing keratoconus, heterochromia, congenital cataract, zonular cataract, and coloboma.

Clarence W. Rainey.

Fritz. The speed of propagation of the blood in the retinal vessels. *Bull. Soc. Franç. d'Opht.*, 1938, v. 51, pp. 509-515.

Although it is impossible to ascertain the speed of propagation of the blood in an absolute manner, it is possible to ascertain the presence in an eye of certain conditions that indicate increased or diminished speed of flow. When the retinal vessels have a normal caliber of 0.1 mm., and the column of blood in the vein becomes fragmented when the external pressure on the globe amounts to seven tenths of the pressure required to stop the flow of blood in the artery, the condition of the circulation in the retinal vessels is normal. A marked difference in arterial and venous pressures in the eye, together with absence of venous pulsation and a pale appearance of the optic-nerve head, indicate abnormal rapidity of the blood stream in the capillaries, while the opposite conditions indicate slow speed of the blood stream. Clinically, slackened speed favors formation of thrombus.

Clarence W. Rainey.

Gifford, S. R., and Marquardt, G. Central angiospastic retinopathy. *Arch. of Ophth.*, 1939, v. 21, Feb., pp. 211-228.

The authors review the literature and present eight cases of a type of central retinopathy which affects young or middle-aged persons, especially men, with little or no increase in general blood pressure. Special examinations revealed definite signs of peripheral vascular spasm which is the guide to diagnosis and treatment. Reasons are given for believing that this and a group of similar conditions described under various names are due to spasm of the smaller retinal arterioles or capillaries, with resulting ischemia and edema of the retina, especially in its macular portion. The cases reported are divided into two groups; the first gives a typical picture of central retinopathy without involvement of the larger retinal vessels and the second, with involvement of the larger vessels.

J. Hewitt Judd.

Grönvall, H. Fundus changes and ocular disturbances in migraine. *Acta Ophth.*, 1939, v. 16, pt. 4, p. 602.

A review of the literature and a report of a case of migraine in a woman eighteen years old. With one attack she had scintillations, dizziness, and loss of vision in the right eye. Recovery of vision was rapid, except for the upper nasal quadrant, where loss of vision persisted. On ophthalmoscopic examination the following day, the lower half of the retina was edematous, the arteries were constricted, and one branch entirely obliterated. The diagnosis was migraine with angiospasm.

Ray K. Daily.

Hanum, Steen. Diabetic retinitis. *Acta Ophth.*, 1939, Supplement 16.

The summary of this comprehensive manuscript is based on study of 966 diabetic patients, of whom 195 had retinal changes. The greatest incidence of diabetes and retinitis is in the fifth and sixth decades of life. Diabetic retinitis occurs more frequently in women. The frequency of retinitis rises with the duration of the diabetes. There is no relation between the gravity of the diabetes and the incidence of retinitis, but the latter is more frequent in untreated or inadequately treated diabetics. The fundus appearance of diabetic retinitis may be exudative, circinoid, hemorrhagic, or proliferative in type. From the study of twelve cases the author believes that a reduction in the ascorbic-acid content of the blood is an etiologic factor in proliferative retinitis. Careful study fails to show that diabetic retinitis is dependent on renal changes, hypertension, or disturbances in blood chemistry. Retinal hemorrhages appearing after the institution of insulin treatment are attributed to changes in intraocular tension. Except for the proliferating type of retinitis, the prognosis for vision is good. A mathematical calculation of the mortality rate of diabetics with and without retinitis shows that it is 2.7 times higher for men, and 1.6 times higher for women with than without retinitis.

Ray K. Daily.

Jensen, J. P. Retinal changes after experimental gastrectomy in dogs. *Acta Ophth.*, 1938, v. 16, pt. 4, p. 649.

After resection of the ventricle alone, or of the ventricle and of Brunner glands from the duodenum, young dogs developed a clinical picture similar to pellagra and died in spite of sufficient nutrition. In many of these dogs there developed a degeneration of the ganglion and bipolar cells in the retina, with

proliferation of the glial tissue. Vitamins were ineffective, but administration of gastric juice was followed by improvement. These findings question the assumption that lack of vitamin C is responsible for the ocular symptoms of pellagra, and they suggest that a disturbance of gastric secretions may be the etiologic factor. (Illustrations.)

Ray K. Daily.

Jensen, V. A. Anastomosis formation after embolism of the central retinal artery. *Acta Ophth.*, 1938, v. 16, pt. 4, p. 485.

A report of three cases. These arterial anastomoses may take place within the retinal circulation if the embolism lodges in a branch of the central artery, or they may develop between the retinal and ciliary arterial systems if the embolism lodges in the main trunk of the central artery. From his own cases and from a review of the literature the author concludes that the probability of an anastomosis developing is greatest in cases where the initial vascular obstruction is incomplete, so that the capillary communications get time to dilate and gradually take charge of the blood supply. In such cases the gradually enlarging vessels become visible in the fundus after a period varying from ten days to three weeks. In complete sudden embolism of the main trunk the capillary communications are insufficient to keep up the circulation and no anastomosis develops. (Illustrations.)

Ray K. Daily.

Johnstone, I. L. Maculo-cerebral degeneration (Batten-Mayou disease or juvenile amaurotic idiocy). *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 2, p. 769.

A report of two sisters aged thirteen

and eleven years respectively with history and findings of cerebral degeneration and macular changes which had begun at the ages of nine and seven years respectively. In four years time there was optic atrophy and epileptiform convulsions. The macular lesion gradually extended.

Beulah Cushman.

Kay, B. *Cysticercus cellulosae* in the vitreous. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 2, p. 794.

A cysticercus is reported in a 42-year-old laborer whose vision suddenly became blurred. The dense white non-vascular cyst was visible in the vitreous, and at times the scolex was seen in its movements. The cyst remained visible with movement of the scolex for the following two years. The surrounding vitreous was degenerated and there were fine strands attached to the cyst wall.

Beulah Cushman.

Kovarskaja, S. S., and Sorkina, S. I. Tuberculous detachment of the retina. *Viestnik Opht.*, 1939, v. 14, pts. 2-3, p. 74.

A report of five cases in which the diagnosis is based on the youth of the patients, subretinal striae, infiltrated foci in the fundus, and tortuosity of the vessels. In such cases general treatment should precede surgical intervention.

Ray K. Daily.

Lijo Pavia, J. Tears of the retina, presence in the vitreous of the retinal hole or flap. *Rev. Oto-Neuro-Oft.*, 1938, v. 13, Oct., p. 230.

Clinical observations by the author on the mechanism of production of retinal holes and tears and their influence on the pathogenesis of retinal detachment.

Edward P. Burch.

Lisch, Carl. Vasopathy and eye. *Klin. M. f. Augenh.*, 1939, v. 102, Feb., p. 228.

Lisch's microscopic investigations showed pathologic changes of the capillaries in all patients with vasopathy. Fifty-one percent of the patients had hemorrhages in the nail grooves, but none showed retinal periphlebitis. The author thinks that vasopathy, especially Buerger's disease, does not play the determining role in the development of retinal periphlebitis, as asserted by Marchesani; and that vasopathy is relatively rarely the cause of periphlebitic changes in the retina.

C. Zimmermann.

Niccol, W. A family with bilateral developmental defects at the macula. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 2, p. 763.

A boy aged four and his sister aged three years had similar macular defects with evident excavation, bounded by a broad bluish-white border like a rolled rim, not measurably projecting. In spite of these defects there was no nystagmus or sign of difficulty in seeing. The younger child had a left convergence and it was because of this condition that the child was brought for examination.

Beulah Cushman.

Nordlöw, W. A case of spontaneous retinal detachment in identical twins. *Acta Ophth.*, 1938, v. 16, pt. 4, p. 579.

A report of retinal detachment in the right eyes of a pair of twins, myopes, 41 years old. Atrophic foci were found in the two unaffected eyes. The detachments in the two sisters occurred one year apart. In one a satisfactory result was obtained with electrodiathermy. In the other, the retina remained detached

in spite of repeated coagulations. (Illustrations.)

Ray K. Daily.

Perera, C. A. Congenital grouped pigmentation of the retina. *Arch. of Ophth.*, 1939, v. 21, Jan., pp. 108-110.

The clinical picture of this entity is described and illustrated in a drawing showing an extensive involvement of the fundus in one eye of a four-year-old Jewish boy. The fundus of the other eye and the fundi of his parents were normal.

J. Hewitt Judd.

Ploman, K. G. Heparin treatment of thrombosis of the central retinal vein. *Acta Ophth.*, 1938, v. 16, pt. 4, p. 502.

The author used a 5-percent heparin solution intravenously. The material consisted of two cases of thrombosis of the central retinal vein and six cases of thrombosis of one of its branches. Of the two cases of central thrombosis one recovered completely and the second showed rapid improvement. Of the six cases of thrombosis of a branch, five showed an average improvement of 0.3 in visual acuity. One case was unimproved.

Ray K. Daily.

Post, L. T. Thermophore treatment of retinal detachment. *Southern Med. Jour.* 1939, v. 32, March, pp. 273-278.

The thermophore method of treatment of retinal detachment is described, and seven cases successfully so treated are reported in detail. Advantages of this method over electrocoagulation are discussed. (Illustrations.)

George A. Filmer.

Rosengren Bengt. Results of treatment of retinal detachment with diathermy and injection of air into the vitreous. *Acta Ophth.*, 1939, v. 16, pt. 4, p. 573.

A tabulated report of 26 cases with satisfactory results. Ray K. Daily.

Samuels, Bernard. **Pathologic picture of retinal detachment.** Arch. of Ophth., 1939, v. 21, Feb., pp. 273-314.

This survey is based on the study of 41 anatomic specimens in an effort to determine the etiologic importance of lacerations, to differentiate between recent and old changes in retinal detachment, to obtain information as to degenerative changes in the retina, and to search for the causes of the development of iritis with glaucoma in cases of detachment of long standing. Under the causes of detachment, the author discusses Gonin's theory of traction of the detached vitreous, Vogt's theory of cystic degeneration, Hanssen's theory of stretching of the retina in myopia, the importance of congenital weakness as a factor in traumatic detachment, Weve's theory of detachment caused by retinal cyst, and choroidal transudates in those detachments without lacerations. Under primary anatomic changes in the retina he discusses the localization of holes and lacerations, changes in the vitreous, relation of vitreous to the margins of retinal holes, inversion of the lips of a laceration, cystic degeneration near and far from a hole, large cysts of the retina, and stretching of the retina. Under secondary anatomic changes caused by the age of the detachment and by the complications of inflammation and glaucoma, he discusses the changes in the retina, such as degeneration and atrophy, changes in the blood vessels, folds, changes in the apertures, and splitting of the retina. He also discusses the changes found in the vitreous, ciliary body, iris, lens, choroid, and papilla. The glaucoma which occurs is thought to be secondary to iritis which in turn is probably produced by severe inflammation caused by the absorption of the subretinal fluid. It is pointed out that

an albuminous fluid retained in a cavity over a long period in all probability changes its quality and becomes irritating to neighboring tissues. This is not true of the primary fluid of recent detachments, which in cases with a hole certainly originates from the vitreous, and in those without an aperture probably comes from the retina.

J. Hewitt Judd.

Sobhy Bey, M. **Operative treatment of detachment of retina.** Bull. Ophth. Soc. Egypt, 1937, v. 30, p. 110.

The simplest type of operation for retinal detachment is just as satisfactory as the more complicated types. All the difficulty of the operation lies in localization of retinal tears by the ophthalmoscope during operation. The Coccia ophthalmoscope is recommended.

Edna M. Reynolds.

Tansley, Katharine. **Night blindness.** Brit. Jour. Ophth., 1939, v. 23, March, pp. 161-170.

The purpose of this paper is to review what is actually known of night blindness and how it may be improved or cured through vitamin-A therapy. The author discounts the work that has been done by clinicians and vitamin workers without previous training in this important experimental field. Some general criticisms of present methods are given at the conclusion of the article. The author states that the condition of night blindness is simply a failure in dark adaptation, and that the connection between night blindness and vitamin-A deficiency is now so widely accepted that it is not necessary to go into the literature for findings. It is the feeling of the author that variations from the normal dark adaptation curve can be used to diagnose vitamin-A deficiency provided experienced ob-

servers, proper apparatus, and a sufficiently long period of dark adaptation are employed. Recent methods test too many patients in too short a period of time to make the findings of worth. (References.) D. F. Harbridge.

Vannas, Mauno. The localization of ruptures and foreign bodies in the fundus. *Acta Ophth.*, 1938, v. 16, pt. 4, p. 588.

The author's method consists in introducing a sharp needle anteriorly into the eyeball, guiding it ophthalmoscopically through the eyeball, and making a counterpuncture through the tear. The needle then remains in place until the area around it is coagulated. (Illustration.) Ray K. Daily.

Weve, H. J. M., and Fischer, F. P. The acetylcholinesterase content of the subretinal fluid in retinal detachments with tears. *Ophthalmologica*, 1939, v. 96, March, p. 348.

In retinal detachment due to rupture, the subretinal fluid always contains acetylcholinesterase. This substance is normally present in retina, choroid, and vitreous, but not in aqueous. Early in the detachment, the ferment comes from the retina and choroid and later only from the vitreous. The significance of this finding for the pathogenesis of retinal detachment is discussed. The only ferment that occurs in the aqueous constantly, namely, proteinase E, is not found in the subretinal fluid. F. Herbert Haessler.

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Cibis, Paul. The etiology and frequency relations of retrobulbar neuritis. *Klin. M. f. Augenh.*, 1939, v. 102, Feb., p. 205.

The author emphasizes the difficulties of the etiologic conception of retrobulbar neuritis, on account of the possibility of association of several causes and the experience that in the presence of any given etiologic factor a sclerotic affection of the optic nerve can never be excluded, as isolated disease of the optic nerve in multiple sclerosis may precede by years its other symptoms. The same is true as to disseminated encephalomyelitis, which has the same tendency to remission. The primary cause of multiple sclerosis has not been ascertained. With regard to these questions 189 cases were examined which had attended the Heidelberg eye clinic between January 1, 1920, and December 31, 1937. Disseminated sclerosis was the probable cause in 40 percent of retrobulbar neuritis, in 60 percent of the acute cases, and in about 70 percent of the acute forms after exclusion of all cases in which other causes were probable. In 55 cases no etiologic factor was proved. C. Zimmermann.

Dymling, Otto. Contribution to the clinic of optic neuritis. *Acta Ophth.*, 1938, v. 16, pt. 4, p. 547.

A tabulated report of blood studies in 27 cases of retrobulbar neuritis. Most of the cases had a lymphocytosis with normal or slightly raised white count. The author believes that the lymphocytosis indicates vitamin-B deficiency, and thus opens a new path in the search for the etiology of retrobulbar neuritis. Ray K. Daily.

Evans, J. J., and Evans, P. J. Ocular changes associated with nevus flammeus. *Brit. Jour. Ophth.*, 1939, v. 23, Feb., pp. 95-105.

Described herein are two cases of optic atrophy and other changes associated with nevus flammeus. Defective

nutrition resulting from an abnormal vascular supply induces optic atrophy which is neither dependent upon nor secondary to a rise of intraocular tension. In one case there were varying periods of increased tension, while in the other no increase in intraocular tension was apparent in examinations covering a thirteen-year period. A rare opportunity for observing a hemangioma of the choroid and of the course of entry of this tissue into the globe was afforded. Intracranial vascular abnormalities and irradiation cataract were observed in the first case presented. (Figures, bibliography.) D. F. Harbridge.

Gorse and Calmettes. **Oxycephaly and optic atrophy.** Bull. Soc. Franç. d'Opht., 1938, v. 51, pp. 578-586.

The authors describe a case of oxycephaly in an adult male. There was upward elongation with tapering of the skull, first noticed at birth. At the age of seventeen years the patient began to have headache, with loss of vision due to optic atrophy of the simple type. He also suffered personality changes and had a tendency to fall. There was symmetric, conical enlargement of the skull, produced by a thin-walled hypertrophy. There was simple bilateral optic atrophy. In the authors' opinion the optic atrophy was the result of increased intracranial pressure and papillary stasis.

Clarence W. Rainey.

Lauber, Hans. The relationship between intracranial and retinal blood pressure and intraocular tension; the treatment of tabetic optic atrophy. Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 2, p. 661.

Measurement of intracranial pressure by use of the ophthalmodynamometer has been stated as the pressure in

the vein at the moment of the first pulsations, multiplied by ten. Blood pressure in the ocular arteries, capillaries, and veins must be higher than the intraocular tension. In prognosis of glaucoma the level of blood pressure is very important, the lower the blood pressure, the more rapid the progression of glaucoma.

The author and Sobanski studied conditions of vascular pressure in tabetics and found that tabetic patients with progressing optic atrophy showed low blood pressure. Tabetic patients with high blood pressure were free from optic atrophy. In tabes, following severe hemorrhage and retinitis pigmentosa, lability of the cardiovascular system with tendency toward hypotonia is found. The author emphasizes a general treatment which would elevate the general arterial tension or lower the intraocular tension. The results of treating 75 patients with tabetic atrophy are given; 55 eyes showed improvement, 43 remained unaltered, 33 became worse. The general condition also improved with the higher pressure.

The author concludes that tabetic optic atrophy must be considered with the question of the primary lesions in glaucoma because one of the principal factors leading to functional and anatomic changes is disproportion between blood pressure and intraocular tension.

Beulah Cushman.

Mamedov, B. Decortication of the common and internal carotid arteries in the therapy of optic atrophy. Viestnik Opht., 1939, v. 14, pts. 2-3, p. 108.

A report of four cases shows that except in tabetic optic atrophy the operation is helpful; it is more effective in the young, and in retinitis pigmentosa should be supplemented by vitamin therapy.

Ray K. Daily.

Orzalesi, Francesco. A prevalently retrobulbar optic neuritis of obscure etiology in the course of a psoriasis. *Boll. d'Ocul.*, 1938, v. 17, May, pp. 350-369.

The history is given of a man of 22 years who about four years before had become affected by psoriasis of the extensor surface of the limbs which gradually became general as a form of psoriatic erythrodermia. Suddenly the vision failed to 5/30 in O.D. and 2/30 in O.S., with a central scotoma for form and colors. The peripheral fields were of normal limits and the fundi were negative with the exception of a slight peripapillary edema. The etiologic-pathogenetic factors of the optic neuritis are enumerated and discussed, and are eliminated in this case. The conclusion is reached that a relation between the psoriasis and the optic neuritis is not to be excluded. (Bibliography.)

M. Lombardo.

Popov, M. Z. Worm's operation in opticochiasmal arachnoiditis. *Viestnik Opht.*, 1939, v. 14, pt. 1, p. 66.

An 18-year-old woman following an attack of grippe developed exophthalmos, ptosis, complete ophthalmoplegia, and loss of vision in the left eye, and a right optic neuritis with vision limited to light perception. Drainage of the ethmoidal and sphenoidal sinuses was ineffective. An exploratory Krönlein-Golowin operation on the left eye revealed a diffuse edema of the orbital tissues and marked swelling of the optic nerve. In view of negative neurologic findings the conclusion was that the nerves were strangulated in the optic canal. In the hope of saving some vision in the right eye, the author performed a decompression of the right optic nerve, removing the inner wall of the optic canal. There was immediate

improvement in the fundus picture and vision rose to 0.05. (Illustrations.)

Ray K. Daily.

Scheyhing, Hans. Optic neuritis with transient blindness and meningo-encephalitis after vaccination. *Klin. M. f. Augenh.*, 1939, v. 102, Feb., p. 223.

A child of fourteen months became blind fourteen days after vaccination. It showed bilateral optic neuritis and opisthotonos, and lumbar puncture revealed high pressure in the sterile fluid. A diagnosis of encephalitis with meningitis was made and the child was placed in the hospital. Intramuscular injections of 28 c.c. of convalescent blood from a vaccinated individual, and daily lumbar puncture, were followed by recovery. The literature is quoted to show that out of 89 patients with postvaccinal encephalitis 31 died.

C. Zimmermann.

Sobanski, Janusz. Gray discoloration of the optic nerve. *Klinika Oczna*, 1938, v. 16, pt. 6, p. 749.

A description of a congenital abnormality which consisted of gray discoloration of the optic nerve and a broad connective-tissue ring surrounding it. (Illustrations.)

Ray K. Daily.

Sourdille, G. P. Abnormal forms of optic neuritis. *Bull. Soc. Franç. d'Opht.*, 1938, v. 51, pp. 569-572.

Two cases of loss of vision during adolescence were thought to be due to hypertrophy of the hypophysis.

Clarence W. Rainey.

Van Heuven, J. A. Papilledema. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 2, p. 549.

After extensive experimental work the author agrees with Bauermann that absence of venous pulsations on the op-

tic disc is an important finding in suspected increase of intracranial pressure. He found, as have others, that in most cases brain tumors are associated with general edema of the central nervous system (even 10-percent increase in water content producing the edema), but it was not found in all cases. This fact might account for the lack of edema with pituitary lesions. The writer concludes that the cause of papilledema has not yet been completely explained. Beulah Cushman.

Vilenkina, A. I. Hypotony in tabetic atrophy of the optic disc. *Viestnik Ophth.*, 1939, v. 14, pts. 2-3, p. 69.

Four cases illustrate the improvement obtained through the lowering of intraocular tension in early cases of tabetic optic atrophy.

Ray K. Daily.

Wieczorek, Antoni. Retrobulbar neuritis. *Klinika Oczna*, 1939 v. 17, pt. 1, p. 1-97.

This exhaustive monograph on the subject thoroughly reviews the literature and closes with a very complete bibliography.

Ray K. Daily.

12

VISUAL TRACTS AND CENTERS

Bush, F., and Möller, H. U. Ophthalmologic symptoms in intracranial tumors, with special reference to visual acuity. *Acta Ophth.*, 1939, v. 16, pt. 4, p. 453.

This is a brief summary of a survey of 352 cases. Papilledema was present in 70 percent of them. In 25 percent the edema was greater on the side of the tumor. There were 96 cases with visual-field defects, and in 25 percent of these the defects were hemianopsic in type. Disturbances in pupillary reactions occurred in 19 percent of the cases, and

disturbances in ocular motility in 12 percent. This survey indicates that the prognosis for vision in cases of choked disc is good until secondary atrophy sets in. The author urges operation for pituitary tumor at the first appearance of eye symptoms. Ray K. Daily.

Kenel, Ch. Five cases of traumatic opticochiasmatic arachnoiditis. *Ophthalmologica*, 1939, v. 96, March, p. 336.

In four patients who had suffered severe frontal injury followed by headache, insomnia, dizziness, some diminution of central vision, great bilateral peripheral contraction of the fields, and increased pressure in the retinal arteries, a diagnosis of opticochiasmatic arachnoiditis was made. The diagnosis was confirmed at operation when a fibrous or fibrinous membrane was removed. The operation was followed by improvement, especially of the fields, but eventually all the symptoms recurred. In a fifth patient with similar manifestations, no operation was done.

F. Herbert Haessler.

Lundberg, Åke. Amaurosis accompanying a radiographically visible aneurysm of the internal carotid artery. *Acta Ophth.*, 1939, v. 17, pt. 1, p. 69.

A report of a case in a 64-year-old man with arteriosclerosis and cerebral hemorrhage, diagnosed by X ray and verified by autopsy. Six years after the development of right homonymous hemianopsia vision suddenly became cloudy, and in five months the patient was blind. The radiograph showed an aneurysm to the left of the sella turcica. At autopsy both internal carotids were found rigid, because of calcification, and irregular in caliber. To the left of and close to the chiasma there was a small aneurysm, without hemorrhage.

Ray K. Daily.

Olivecrona, H. The significance of eye symptoms in the diagnosis of brain tumors. *Acta Ophth.*, 1938, v. 16, pt. 4, p. 431.

A comprehensive review of the ocular symptoms associated with intracranial lesions. Ray K. Daily.

Osterberg, G. Traumatic bitemporal hemianopsia caused by sagittal rupture of the chiasm. *Acta Ophth.*, 1938, v. 16, pt. 4, p. 466.

A report of two cases and a review of the literature. To explain the pathogenesis of this injury the author stretched the optic chiasm, twelve hours after death, by means of two Prince forceps, varying the force and rapidity of the pull. The microscopic sections of this tissue show numerous minute rhomboid and linear tears placed in or close to the median plane of the chiasm. These findings convince the author that the median plane of the chiasm is its most vulnerable point, and that such tears can explain total interruption of all crossed chiasmal pathways. (Illustrations.) Ray K. Daily.

Rönne, Herring. Focal diagnosis of the visual path. *Acta Ophth.*, 1938, v. 16, pt. 4, p. 446.

A discussion of the diagnostic significance of the various hemianopsias. Ray K. Daily.

Scardapane, Florindo. Severe amblyopia consecutive to enterorrhagia in a patient affected by hemophilia. *Boll. d'Ocul.*, 1938, v. 17, Aug., pp. 674-682.

A man of 38 years after a profuse hemorrhage had shown the following symptoms: The right eye was proptosed, with vision reduced to counting of fingers. The visual field was con-

tracted nasally and below including part of the central zone. The vision of the left eye was normal, but the visual field showed loss of field below and temporally. Both discs were pale with contracted arteries. X-ray examination of the skull showed on the right a rounded opacity about 20 mm. in diameter in the middle cranial fossa. Seven years later these symptoms were still present with the exception of the exophthalmos. Scardapane is inclined to think that an important factor in the production of the descending optic atrophy was the compression of the optic pathways by a cranial hemorrhage which had gradually resorbed. (Bibliography, 2 figures.)

M. Lombardo.

Spotnitz, H. Subjective foveal hemianopsia during dark adaptation in patients with tumors of a temporal lobe. *Bull. Neur. Inst. New York*, 1938, v. 7, Sept., p. 170.

Two hundred cases of suspected intracranial disease were examined. Transient subjective foveal hemianopsia was noted in three of the cases during a study of foveal dark adaptation. None of the patients had foveal hemianopsia upon examination with tangent screen or hand perimeter. Two had gliomas, and a third had a subdural hematoma involving the function of the temporal lobe. Tests of foveal dark adaptation may therefore be of use for demonstration of visual-field defects before they can be demonstrated by ordinary tests of the visual fields. F. M. Crage.

Vail, Derrick. Syphilitic opticochiasmatic arachnoiditis. *Amer. Jour. Ophth.*, 1939, v. 22, May, pp. 505-515; also *Trans. Amer. Ophth. Soc.*, 1938, v. 36, p. 126.

13

EYEBALL AND ORBIT

Artemiev, H. I. Pseudoneoplasms of the orbit. *Viestnik Opht.*, 1939, v. 14, pt. 1, p. 31.

A review of the literature and a report of a case of fibrous myositis of the orbit, causing exophthalmos and diagnosed as a neoplasm. The patient, a 34-year-old woman, had a right exophthalmos and pain in the orbit. At operation a tumor was not found and a biopsy of the external rectus established the diagnosis. The etiology of this disease is obscure; the author believes that it is a manifestation of chronic rheumatism.

Ray K. Daily.

Breuer, K. Formation of cysts after exenteration of the eyeball. *Klin. M. f. Augenh.*, 1939, v. 102, Feb., p. 254.

The right eye of a girl of fourteen years had been perforated six years earlier by an accidental thrust with a manure fork, necessitating exenteration. About three years back a vesicle had developed in the orbit. It had gradually increased in size, without pain. It was opened and a yellowish fluid evacuated. A shrunken piece of sclera was extirpated, but the conjunctiva not sutured, so as to avoid renewed formation of a cyst. The entire inner surface of the piece of sclera was lined with pavement epithelium. It is considered probable that limbal conjunctiva (having pavement epithelium) was implanted by way of the suture.

C. Zimmermann.

Doherty, W. B. A new orbital implant. *Amer. Jour. Ophth.*, 1939, v. 22, April, pp. 419-420.

Skydsgaard, H. Exophthalmos coincident to intracranial tumors. *Acta Ophth.*, 1938, v. 16, pt. 4, p. 474.

A review of the literature and a tabulation of the author's own material, which comprised five cases of bilateral and nine cases of unilateral exophthalmos. The intracranial lesions causing the exophthalmos were a glioma of the temporal lobe, a carotid aneurysm, three tumors of the hypophysis, an acoustic neurinoma, and eight meningiomas.

Ray K. Daily.

Soliman, Farag. Congenital ptosis, microcornea, colobomata of iris, choroid, and optic disc. *Bull. Ophth. Soc. Egypt*, 1937, v. 30, p. 199.

A case having all the above listed congenital defects is reported and the embryology of colobomata is briefly reviewed.

Edna M. Reynolds.

Tille, H., and Leroux-Robert, J. Comparison between certain primitive orbital tumors and the so-called mixed tumors, or salivofacial glandular epitheliomas. *Bull. Soc. Franç. d'Opht.*, 1938, v. 51, pp. 595-629.

This report contains the results of a histologic study of a number of surgical specimens. The lacrimal glands, and the accessory lacrimal glands disseminated about the orbit, are a part of a regional system which includes the pituitary and salivary glands. The histologic characteristics of the tumors of the orbit are the same as those of tumors of the other glandular structures of the system. The acinocanicular and canicular forms possess the histologic characteristics and evolutionary history of the so-called mixed tumors of the rest of the system.

Clarence W. Rainey.

14

EYELIDS AND LACRIMAL APPARATUS

Adams, P. H. Temporary alteration in refraction due to eyelid tumors.

Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 2, p. 736.

Five cases are presented with alteration in the refraction due to localized swellings of the upper lids such as chalazia and granulation tissue. In each case the condition returned to normal after the swelling disappeared.

Beulah Cushman.

Alvaro, M. E. Treatment of recurrent styes by staphylococcus antitoxin. Rev. Oto-Neuro-Oft., 1938, v. 13, Oct., p. 219.

The author reports the beneficial effect of staphylococcus antitoxin in the treatment of 27 instances of recurrent styes. The injections were first given subcutaneously, starting with a dosage of 0.1 c.c. of the antitoxin, and then intramuscularly as larger dosages were employed. The local, focal, and systemic reactions were carefully observed after each injection. In only two patients were untoward general effects noted.

Edward P. Burch.

Bakry, M. M. El. Tattooing replacing lacking lashes. Bull. Ophth. Soc. Egypt, 1937, v. 30, p. 99.

A line of lashes of the same color and thickness as the original one is drawn on the lid margin with India ink.

Edna M. Reynolds.

Bourguet, J. Anatomical removal of the lacrimal sac. Ann. d'Ocul., 1939, v. 176, Feb., pp. 109-126. (See Amer. Jour. Ophth., 1939, v. 22, April, p. 472.)

Cavallacci, G. Concerning the pathogenesis of blepharochalasis. Arch. di Ottal., 1938, v. 45, July-Aug., p. 171.

The author describes three juvenile cases and one senile case of blepharochalasis. He believes that the pathogenesis of the juvenile form is based on

both local and general factors. The local condition is a weakness of the skin of the lid (a general deficiency in tone), especially of the fibro-elastic tissue. The general cause is believed to be a vasomotor and endocrine disturbance coincident with puberty. H. D. Scarney.

Czukurász, Ida. About the sliding flap, known also as Hungarian plastic. Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 2, p. 561.

The two Hungarian surgeons, Blaskovics and Imre, using different techniques, devised essentially the same methods for covering a skin defect, especially in replacing the anterior layer of the lower eyelid. (Diagrams, illustrations.)

Beulah Cushman.

Dorofeev, V. H. Recession of the levator in paralytic lagophthalmos in lepers. Viestnik Opht., 1939, v. 14, pt. 1, p. 69.

A description of a procedure similar in principle to Golstein's operation. In six cases the results were satisfactory functionally and cosmetically. (Illustrations.)

Ray K. Daily.

Granström, K. O. Dacryocystitis in children, with particular reference to neglected congenital stenosis of the nasolacrimal duct. Acta Ophth., 1939, v. 16, pt. 4, p. 512.

In nine out of 28 cases of dacryocystitis between the ages of one and fifteen years the etiology was untreated congenital stenosis of the nasolacrimal duct. The article contains also a report of a case of serpiginous ulcer with loss of vision, caused by nasolacrimal stenosis, in an infant 1½ years old.

Ray K. Daily.

Jayle, G. E. Contribution to the study of acquired spasm of the levator mus-

cle of the upper lid. *Ann. d'Ocul.*, 1939, v. 176, Jan., pp. 1-17, and March, pp. 173-186.

Symptomatically, spasm of the levator muscle is important in localizing lesions affecting the upper lid. There is no absolute distinction between permanent and intermittent spasms, which sometimes are bilateral and sometimes alternating. In some cases a spasm of the levator which is permanent on looking ahead may relax on looking down and be replaced by retraction of the opposite upper lid. Spasm of the levator must be differentiated from sympathogenic widening of the palpebral fissure which involves the lower lid also.

Permanent and intermittent spasms have comparable but not identical pathogenesis. In bilateral cases the lesion is usually peduncular, in the region of the posterior white commissure. Monocular spasm is caused by lesions near the third-nerve nucleus, except in certain intermittent cases. It is difficult to determine the exact mechanism of these phenomena but they are probably related to disturbance in the functional associations of the levator nucleus. There may be associated neurological lesions in the oculomotor, postural, or vestibular systems.

John M. McLean.

Khalil, Mohammed. *Tarsitis syphilitica*. *Bull. Ophth. Soc. Egypt*. 1937, v. 30, p. 113. (See *Amer. Jour. Ophth.*, 1938, v. 21, May, p. 590.)

Mitzkevich, L. D. *The technique of the Millingen-Sapeshko operation*. *Viestnik Opht.*, 1938, v. 13, pt. 6, p. 848.

The author found the application of collodion to the skin of the lid very helpful in turning the cutaneous lip of the wound out and fixing it for the first

two or three postoperative days. This position facilitates the taking of the intermarginal implant. Ray K. Daily.

Mohamed, I. A. *Meibomian glands—general pathology*. *Bull. Ophth. Soc. Egypt*, 1937, v. 30, p. 127.

The meibomian glands are considered of paramount importance in the pathogenesis of indolent lid, corneal, and conjunctival affections in Egypt when the chronic inflammatory state of the conjunctiva is apt to initiate a seborrhea of the meibomian glands accompanied by excessive or altered secretion. The literature on the subject is reviewed. MacCallan's statement that the trachoma follicles which we are accustomed to call T. 2a are nothing but dilated ducts of the meibomian glands is refuted. Edna M. Reynolds.

Nastri, Francesco. *Treatment of staphylococcic affections of the eyelids by anastaphylotoxin*. *Boll. d'Ocul.*, 1938, v. 17, Aug., pp. 663-673.

The writer reports the beneficial effect of staphylococcus anatoxin used hypodermically in 35 patients from 2½ to 56 years of age affected by ulcerative blepharitis or relapsing chalazia. In many cases the affection was an old one and did not respond readily to the usual remedies. (Bibliography.)

M. Lombardo.

Nižetić, Z. *Dacryocystorhinostomy in two sittings*. *Klin. M. f. Augenh.*, 1939, v. 102, Jan., p. 71.

The method is described in detail.

Nižetić, Z. *Restoration of the lacrimal passages*. *Klin. M. f. Augenh.*, 1939, v. 102, Jan., p. 67.

An operation for relief from obliteration of lacrimal canaliculi by intense trachomatous changes is described in

detail and illustrated. It is said to be simpler and cosmetically better than all other methods. C. Zimmermann.

Sander-Larsen, S. Silk-cord treatment of blennorrhea of the lacrimal sac. *Acta Ophth.*, 1938, v. 16, pt. 4, p. 655.

Through a cannula the author passes a silk thread from the lacrimal punctum into the nose. Both ends of the thread are fastened on the face and the thread is cleansed daily merely by moving it about. The author finds this procedure adequate for dacryocystitis. (Illustration.) Ray K. Daily.

Schupfer, Francesco. The Mikulicz syndrome. *Boll. d'Ocul.*, 1938, v. 17, June, pp. 452-483.

A woman of 29 years had noticed for about a month a slowly progressing enlargement of both lacrimal glands and the left parotid, and some tumefactions at the left angle of the mandible and in the left inguinal region. A microscopic examination of a specimen of the lacrimal gland showed a granulomatous tuberculous process. The author concludes that the process was due to tuberculous toxins. A second case is reported of a woman of seventy years who showed enlargement of the lacrimal glands and left parotid with bilateral exophthalmos of two years duration. A biopsy of the parotid and lacrimal gland showed a lymphomatous lesion. The author is of the opinion that this was a case of Mikulicz's disease. (Bibliography, 14 figures.)

M. Lombardo.

Seesy, A. M. El. Gangrene of the eyelids. *Bull. Ophth. Soc. Egypt*, 1937, v. 30, p. 120.

Four cases of gangrene of the eyelids are reported. The disease was unilateral in all cases, and the ciliary margin of

the lid was not affected. The cornea and conjunctiva remained intact in spite of the severe edema and profuse discharge. Edna M. Reynolds.

Scoud, G. A. El. A new operation for trichiasis. *Bull. Ophth. Soc. Egypt*, 1937, v. 30, p. 97.

The tarsus is incised immediately below the roots of the cilia and parallel to the lid margin from the inner to the outer canthus and down to the muscle. The separation of the lid margin must be complete. The lid margin is then everted and fixed in position with three sutures. The operation is similar to the Panas operation but the skin and muscle are not cut. The method leaves a rough horizontal scar and is not suitable for operation on the upper lid.

Edna M. Reynolds.

Sobhy Bey, M. Restoration of the eyebrow. *Bull. Ophth. Soc. Egypt*, 1937, v. 30, p. 108.

A pedicle flap from the temple was used to restore an eyebrow in a case in which extensive ectropion had previously been corrected by a Thiersch graft. Edna M. Reynolds.

Somerset, E. J. The significance of errors of refraction in chronic blepharitis of children. *Brit. Jour. Ophth.*, 1939, v. 23, March, pp. 205-212.

Conclusions as based on refractive errors seen in 300 children aged from 2 to 13 years afflicted with blepharitis are: (1) There is no significant difference in the spherical refractive error of children suffering from blepharitis and that of the normal child. (2) The incidence of astigmatism is similar in blepharitis cases and normal children. (3) Unilateral cases do not show blepharitis more frequently in the eye with the greater ametropia. (4) Causes other

than errors of refraction must be sought for in blepharitis of children. (Tables, references.)

D. F. Harbridge.

Tikhomirov, P. E. **Anesthesia of the sphenopalatine ganglion in the therapy of ocular diseases.** *Viestnik Opht.*, 1938, v. 13, pt. 6, p. 829.

A review of the literature is followed by brief reports of six cases of epiphora treated by injection of novocaine into the sphenopalatine fossa. Of three eyes with reflex epiphora there was improvement in one and complete relief in two. In one case with bilateral reflex epiphora there was no improvement. In four eyes with epiphora caused by anatomic changes in the lacrimal apparatus there was no effect from the injection.

Ray K. Daily.

Tiscornia, A., Just, B., and Mercandino, C. **Unusual development of an ethmoidal mucocele, with extension to the lacrimal passages.** *Arch. de Oft. de Buenos Aires*, 1938, v. 13, Sept., p. 485.

A 35-year-old female patient presenting a swelling in the lacrimal region was found to have a mucocele originating in the ethmoid cells. After becoming secondarily injected it extended into the orbit and involved the lacrimal sac and nasal cavity producing in effect a spontaneous dacryocystorhinostomy. The case was successfully operated upon. (Illustrations.)

Edward P. Burch.

Wheeler, J. M. **Correction of ptosis by attachment of strips of orbicularis muscle to the superior rectus muscle.** *Arch. of Ophth.*, 1939, v. 21, Jan., pp. 1-5.

The operation described was devised for those cases in which the lid fails entirely to go up with the eyeball. An

incision 25 mm. long is made in the skin at the level of the upper border of the tarsus, the skin undermined, and a horizontal incision made through the orbicularis muscle 4 or 5 mm. above the tarsus. The incision is then carried through the tarso-orbital fascia, the levator tendon, and Tenon's capsule to the sclera on either side of the tendon of the superior rectus muscle. The muscle is picked up on a squint hook and its superior surface exposed. Strips of orbicularis muscle 4 mm. wide and 10 mm. long are dissected up from the tarsus, and the ends toward the canthi are cut free. The attached ends are about 8 mm. apart. These strips of orbicularis are sutured to the upper surface of the superior rectus muscle with 000 chromic catgut. A moderate temporary lagophthalmos following the operation gradually disappears over a period of a few weeks. The operation gives a good contour to the upper lid without angulation. The steps in the operation are clearly shown by drawings. (Discussion.)

J. Hewitt Judd.

Wheeler, J. M. **Spastic-entropion correction by orbicularis transplantation.** *Amer. Jour. Ophth.*, 1939, v. 22, May, pp. 477-482; also *Trans. Amer. Ophth. Soc.*, 1938, v. 36, p. 157.

15

TUMORS

Dalsgaard-Nielsen, Esther. **Tumor of the sclera.** *Acta Ophth.*, 1939, v. 17, pt. 1, p. 58.

A review of the literature and the report of a case of scleral angiofibroma in a 68-year-old woman. (Illustrations.)

Ray K. Daily.

Fledelius, M. **Metastatic hypernephroma of the uvea.** *Acta Ophth.*, 1939, v. 16, pt. 4, p. 527.

A report of a metastatic choroidal tumor, the size of a hazelnut, situated temporally behind the ciliary body of the left eye. It occurred seven years after extirpation of the left kidney for hypernephroma. A review of the literature shows that only two cases of this neoplasm have been reported previously.

Ray K. Daily.

Ibrahim, F. G. Melanotic sarcoma of conjunctiva. *Bull. Ophth. Soc. Egypt*, 1937, v. 30, p. 143.

A case of melanotic sarcoma of the conjunctiva of the upper lid in a patient 65 years of age is reported.

Edna M. Reynolds.

Kryzlikova, P. K., Fishman, P. R. and Kaganova, O. A. Radiotherapy of malignancies of the eye and its adnexa. *Viestnik Opht.*, 1939, v. 14, pts. 2-3, p. 90.

The authors summarize their results as follows: In tumors of the orbit radiotherapy is of but little avail; this is due to the small quantity of soft tissue and the anatomic structure of the orbit which make uniform distribution of rays impossible. Operable cases should be operated upon and followed by prophylactic irradiation; in inoperable cases irradiation should be administered for palliative reasons. Surgery is also indicated in malignant tumors of the eyeball, and irradiation should be reserved for tumors of only one eye. In malignancies of eyelids roentgenotherapy is preferable to operation; surgery and X-ray therapy combined give a more rapid effect than X rays alone. In cases in which surgery does not involve marked cosmetic or functional impairment surgery is more reliable, if only because patients cannot be relied upon to complete their irradiation treatment.

Ray K. Daily.

Lund, Steffen. Boeck's sarcoid in the tear sac. *Oft. Selskab i Köbenhavn's Forhandler*, 1937-1938, pp. 46-51. In *Hospitalstidende*, 1938, Dec. 13.

Boeck's sarcoid, a rare disease, is characterized by multiple tumors of the skin, lungs, lymph glands, and other organs. In the eye, the conjunctiva, lacrimal gland, iris, uvea, and optic nerve have been known to be involved. Two cases are reported which showed typical appearances of this disease in general, and which also revealed bilateral involvement of the tear sacs. The sacs were swollen, partly obstructed, and contained clear but thick and tenacious secretion.

D. L. Tilderquist.

Moutinho, H. Melanocancer of the eye. *Bull. Soc. Franç. d'Opht.*, 1938, v. 51, pp. 491-507.

For the term "melanotic sarcoma" the author substitutes the term "melanocancer," which simply indicates a melanotic tumor of invading and malignant nature, without any histologic restrictions save the existence of melanotic pigment. The author states that all melanotic tumors of the globe have their origin in a pigmented spot derived from the pigmented epithelium of the retina, just as nevocancers of the skin are derived from epidermal melanoblasts. Melanotic tumors arise only in tissues of ectodermal origin.

The formation of melanin was studied in tissue cultures of melanosarcoma cells. The formation of melanin occurs endocellularly by condensation of the protein molecule with absorption of oxygen and loss of water, and is related to such amino acids as tyrosine, phenylalanine, and tryptophane.

The author describes four stages in the development of a melanocancer of the caruncle. Photomicrographs of tu-

mors of various parts of the eye, obtained from nine patients, are shown and described, and their varying histologic structure is interpreted as corresponding to one or other of the four stages in the development of nevocancer of the caruncle.

Clarence W. Rainey.

Pinkerton, F. J. **Malignant melanoma of the choroid with metastases.** Arch. of Ophth., 1939, v. 21, Jan., pp. 68-69.

A man aged 26 years had noticed a gradual reduction of vision for several weeks prior to the onset of an acute inflammatory glaucoma. A posterior sclerotomy was done and immediately a large herniating mass of dark-red or black material resembling clotted blood presented in the wound. This was found to be a melanoma, and the eye was enucleated. A recurrence in the orbit eleven months later necessitated a complete exenteration of the orbit. The patient died from metastatic involvement of the liver 26 months after his first visit.

J. Hewitt Judd.

Sanders, T. E. **Mixed tumor of the lacrimal gland.** Arch. of Ophth., 1939, v. 21, Feb., pp. 239-257; also Trans. Sec. on Ophth., Amer. Med. Assoc., 1938, 89th mtg., p. 214.

A summary of cases previously reported especially as to symptomatology, clinical course, pathologic picture, and treatment is presented. A series of twelve cases of mixed tumor is reported, ten of which have been followed for more than two years. The clinical course in this relatively large series has proved to be consistent. Of eleven cases in which surgical treatment was employed, there was a recurrence in ten. One patient refused operation and died in six years with marked local invasion and metastases to the liver, lung,

and mediastinum. Histologically, the growths seem identical with mixed tumors of other locations. Recurrence is probably due to incomplete removal because of the difficulty of surgical approach and the tendency for early bony invasion. Pathologically, the mixed tumors are probably a definite pathologic entity of dual origin, with the characteristic tendency of the epithelial element to become locally invasive. Early complete surgical removal is indicated as irradiation is not effective. (Photographs, photomicrographs, and discussion.)

J. Hewitt Judd.

Tooke, F. T. **Melanoma of the iris with pathologic findings.** Trans. Amer. Ophth. Soc., 1937, v. 35, p. 56. (See Amer. Jour. Ophth., 1938, v. 21, July, p. 828.)

16

INJURIES

Abramovicz, I. **Localization methods in the eye.** Klinika Oczna, 1938, v. 16, pt. 6, p. 695.

A very thorough review of the literature.

Ray K. Daily.

Czukurász, Ida. **Mechanical injuries of the eye.** Klin. M. f. Augenh., 1939, v. 102, Jan., p. 57.

Out of 100,000 cases in the eye clinic, 892 were caused by mechanical injuries which are here discussed.

C. Zimmermann.

Dollfus, M., Hudelo, A., and Paulin. **A case of severe alteration of the lens and eye by radium.** Arch. d'Opht. etc., 1939, v. 3, Jan., p. 40.

On May 24, 1935, a sailor 48 years old presented himself at the Radium Institute with an epithelioma of the lower lid of the left eye. Examination revealed a non-epidermoid epithelioma.

On the third of June radium treatment was instituted. The entire eyelid was protected with a sheet of lead 2 mm. thick, exposing only the margin of the lower lid. The treatment was ended on the eighth of June. A total dose of 27 hours was spread over six days; 20 to 25 millicurie doses, surface 12 sq. cm., distance 6 mm., 1-mm. platinum filter.

On April 9, 1937, the left eye showed symblepharon of the inferior conjunctiva and a narrowing of the inferior cul-de-sac. The cornea was desquamated throughout the entire lower segment, staining with fluorescein. Ocular tension was normal. On April 20, 1937, there was diffuse bullous keratitis with vascular infiltration, iridocyclitis, numerous synechiae, and an opacified lens. The eye became worse and a year later it had to be removed because of threatened perforation. Histologic examination of the removed eyeball showed: swelling of the anterior portion of the lens, crystalline masses, and innumerable uniform and regularly stippled spherules. The retina, which was normal throughout most of its extent, showed here and there pigmented lesions. There was pigment migration from the pigment epithelium toward the retina and choroid. The iris showed some chronic lesions in the region of the blood vessels and the latter showed true thrombotic areas. The ciliary body showed areas of atrophy, the cornea revealed desquamated epithelium and deep ulceration. (Illustrations.)

Derrick Vail.

Fenton, R. A. Management of eye wounds at the front. *Military Surgeon*, 1938, v. 83, Sept., p. 195.

Ocular-wound cases are divided into four classes. Medical treatment is mentioned, including the proper dressings. The author dwells on the selection of

cases requiring treatment at the front or in field hospital or base hospital, as well as the time and place for surgical care when needed. F. M. Crage.

Kaplan, I. D. First aid in lye burns of the eye. *Viestnik Opht.*, 1939, v. 14, pts. 2-3, p. 114.

The behavior of experimental burns on rabbits shows that the best first aid is profuse irrigation with water.

Ray K. Daily.

Kaplan, I. D. Xanthopsia in acrichinin intoxication. *Viestnik Opht.*, 1939, v. 14, pt. 1, p. 120.

Five cases of intoxication occurred in an acrichinin manufacturing factory. Their clinical course, and a laboratory investigation on rabbits show that acrichinin has a tendency to color the tissues. In the rabbit it was demonstrated in the aqueous, vitreous, and retina. Observations among the workers show that it causes xanthopsia, if it gets into the anterior ocular segment. Introduced into the conjunctival sac it produces corneal erosions.

Ray K. Daily.

Kinukawa, Ch., and Matsuda, S. Clinical and experimental observations on changes in the fundus caused by caterpillar hairs. *Graefe's Arch.*, 1939, v. 140, pt. 1, pp. 70-85.

A boy sixteen years old, after being struck in the left eye by a caterpillar, was observed for 2½ months with recurrent inflammation of the eye. At least five caterpillar hairs wandered back into the interior of the eye. A nodular formation in the iris occurred, typical of that caused by caterpillar hair. In the fundus, two white string-like formations occurred in the periphery and an inflammatory appearance of the papilla was noted. Experiments with rabbits showed similar symptoms

after holding the caterpillar against the superior limbus. The course of the inflammation was described in detail. Microscopic examination of enucleated rabbit eyes thus infected revealed first the presence of pus cells, and later a moderate grouping of epithelioid cells, rudimentary giant cells, and a surrounding proliferation of connective tissue.

H. D. Lamb.

Lisch, Karl. Participation of the eyeball in general chrysiasis. *Klin. M. f. Augenh.*, 1939, v. 102, Jan., p. 103.

A woman of 57 years suffering from lupus erythematoses, tuberculosis of the left lower lid, and left-sided sclerosing keratitis, had been treated from 1925 to 1934 with intravenous injections of aurophos, lopion, and solganal, and in 1937 with intramuscular injections of solganal. For four years the patient had noticed a bluish discoloration of the skin of the face, neck, and arms. In the conjunctiva and cornea were very fine glittering particles of gold, occupying all layers except the epithelium. The occasional inflammatory disturbances of the conjunctiva and cornea occurring under gold therapy are probably signs of intolerance or tissue reaction to deposition of gold salts.

C. Zimmermann.

Medvedjev, H. I., and Natanson, M. C. The diagnosis and management of double perforations of the eyeball. *Viestnik Opht.*, 1938, v. 13, pt. 6, p. 836.

From a review of the literature and 32 cases of their own the authors conclude that such injuries constitute 3 percent of all perforating ocular injuries. They are caused by firearms, and in industry by metal particles. The authors divide these injuries into three groups. Group one comprises the cases in which the foreign body lodges in the

orbit outside of the eyeball: in this group the final result is more favorable than in the other groups. Group two includes the cases in which the foreign body lodges outside of the eyeball but touching the posterior perforation. To group three belong the cases in which the foreign body is caught in the lips of the posterior perforation. Orbital symptoms following a perforating ocular injury, in the absence of infection, are indicative of a double perforation: ophthalmoscopic evidence facilitates the diagnosis, but in most cases ophthalmoscopy is impossible. The magnet test is dangerous. Failure in magnet extraction of a foreign body localized deep in the eyeball is strongly suggestive of a double perforation of the first or second group. X-ray is very valuable. The clinical course and prognosis depend on the size, character, location, and chemical and biologic character of the foreign body.

Ray K. Daily.

Melanowski, W. H. Traumatic scleral cysts. *Klinika Oczna*, 1938, v. 16, pt. 6, p. 739.

One of the author's two cases was of corneoscleral cyst, which developed two years after a perforating injury followed by iritis, traumatic cataract, and glaucoma. The second case was of a scleral cyst at the lower limbus, which had developed four years after loss of vision from absolute glaucoma following a blow on the eye with iron. Surgery resulted in a satisfactory cosmetic appearance in each case. (Illustrations.)

Ray K. Daily.

Motolese, Francesco. Bilateral paralysis of the external rectus muscle associated with papilledema from novocaine rachianesthesia. *Boll. d'Ocul.*, 1938, v. 17, Aug., pp. 629-634. (See Section 4, Ocular movements.)

Pelláthy, Béla. Experiments to lessen the action of mustard gas. *Szemészet*, 1938, v. 1, Dec., p. 48.

Experimental researches undertaken by the author to lessen the action of mustard gas upon the eye are said to prove that the immediate and copious use of water is the best antidote. The addition of various chemical substances was not followed by better results.

R. Grunfeld.

Sharkovski, I. A. Dry gangrene as a complication of adrenalin medication. *Veistnik Opht.*, 1939, v. 16, pt. 1, p. 116.

The subconjunctival injection of 3 minims of adrenalin for a cataract extraction caused a disagreeable constitutional reaction and the operation was postponed. The following day the patient developed petechiae over the abdomen and chest, and dry gangrene of the skin on the back of the hands. The symptoms cleared in six days under atropine injection. The case demonstrates that in elderly patients adrenalin should be used with caution.

Ray K. Daily.

Shimkin, N. Pontocaine, cause of professional eczema in oculists. *Ann. d'Ocul.*, 1939, v. 176, March, pp. 198-203.

Several cases of eczema of the lids are reported after instillation of pontocaine drops. The author acquired dermatitis of the hands from using pontocaine in his practice. Sensitivity was demonstrated in these cases by patch tests with the drug.

John M. McLean.

Thrane, Mogens. Occupational conjunctivitis of film operators using "effect" carbon electrodes. *Acta Ophth.*, 1938, v. 16, pt. 4, p. 625.

Five cases of conjunctivitis associ-

ated with respiratory irritation are reported. This type of carbon electrode contains metallic copper, and the author attributes the disease to the mechanical effect of copper dust and not to the light intensity. Ray K. Daily.

Urrets Zavalia, A., and Obregon Oliva, R. Chrysiasis (gilding) of the cornea during treatment with sanocrysine. *Klin. M. f. Augenh.*, 1939, v. 102, Jan., p. 94.

The authors report weekly slitlamp findings in the corneas of fifty patients with different types of pulmonary tuberculosis who had been treated with sanocrysine. They found the gold in two forms in the normal cornea: superficial crystals in Bowman's membrane and its immediate neighborhood, more numerous in the center, and a fine powder of reddish-brown particles in the deep layers and Descemet's membrane, in greater quantity at the periphery (perhaps metallic or colloidal gold or gold sulphite). C. Zimmermann.

Vannas, Mauno. The localization of ruptures and foreign bodies in the fundus. *Acta Ophth.*, 1938, v. 16, pt. 4, p. 588. (See Section 10, Retina and vitreous.)

17

SYSTEMIC DISEASES AND PARASITES

Bailey, J. H., and Saskin, E. An innocuous clinical entity simulating tabes dorsalis. Pupillonia with absent tendon reflexes (Adie's syndrome). *Amer. Jour. Ophth.*, 1939, v. 22, May, pp. 499-504.

Bencini, Alberto. The ocular behavior of rabbits vaccinated against tuberculosis and the introduction into the anterior chamber of tuberculous antigen. *Boll. d'Ocul.*, 1938, v. 17, Aug., pp. 613-628.

Different groups of rabbits were inoculated with tuberculous antigens, and these and control animals were then injected with virulent tubercle bacilli. The control rabbits showed a high percentage of choroidal specific foci. If Petragnani diagnostic anatuberculin was injected into the anterior chamber, a more diffuse and intense iris reaction followed than in the control rabbits. A greater degree of allergy in the vaccinated rabbits was demonstrated.

M. Lombardo.

Bessemans, A., and Van Canneyt, J. Ocular tissue temperatures in the normal rabbit and in the rabbit affected with syphilitic keratitis. *Arch. d'Ophth.* etc., 1939, v. 3, Jan., p. 18.

Thermo-electric needles were inserted at various points in the ocular tissues of twelve normal rabbits, and in eight rabbits affected with syphilitic keratitis. A summary of the experimental results shows: (1) The tissue temperature in different parts of the rabbit eye differed considerably from animal to animal. (2) The anterior surface of the cornea and particularly the center had the lowest temperature. That of the deeper layers of the lid was a little higher. (3) The temperature of the internal portions of the eye, notably more elevated than that of the external portions, rose quickly on passing from the iris and sclerotic toward the retina and vitreous. This last appeared to have the highest temperature. (4) The internal membranes were more rapidly heated after closure of the lids. (5) These variations were observed without great discrepancy in the normal eye and in the eye affected with syphilitic pallidoiditic keratitis. Thus the deeper portion of the rabbit's eye is rarely invaded by syphilitic infection, because the spirochete is easily killed

by high temperature in vivo. Conversely, since the cornea has a lower temperature than the interior of the eye it is more easily invaded by the spirochete. (Tables, bibliography.)

Derrick Vail.

Bietti, Giambattista. Results of the interferometric method of the ocular endocrinologic field. *Boll. d'Ocul.*, 1938, v. 17, May, pp. 370-400.

The interferometric method lends itself to researches in series which, if conducted in a great number of cases, can give a hint to the possibility of glandular dysfunction and the relation of endocrinic group changes to some ocular diseases. Interstitial keratitis is found frequently associated with dysfunction of thymus and thyroid, and retinitis pigmentosa with changes in the hypophysis. In juvenile cataract, changes in the parathyroid prevail. In ophthalmic hemicrania the thyro-hypophyseal, gonadal, and suprarenal glands show changes. In spring catarrh and keratoconus, suprarenal, thyroid, and thymus dysfunction may be found. Insufficiency of convergence may be attributed to dysfunction of the hypophysis, of the thyroid, and in some cases of the gonads. (Bibliography.)

M. Lombardo.

Caramazza, F. Experimental tuberculosis of the eyeball by inoculation with virulent human tubercle bacilli after passage through lymph glands of guinea pigs. *Boll. d'Ocul.*, 1938, v. 17, July, pp. 503-575.

The writer attempted to demonstrate the virulence in the eye of human tubercle bacilli after their passage through animals. Bacilli were inoculated into a peritracheal gland of a guinea pig and an emulsion of this was

inoculated into other guinea-pig glands and rabbit eyes. Further cross-inoculations between guinea-pig glands and rabbit eyes were repeated. Histologic examination of these eyeballs showed the presence of a tuberculous process. The writer describes the first ocular localization in relation to the site of inoculation, evolution of the obtained lesions, and virulence of the organisms during the various passages through animals. (Bibliography, 54 figures, 6 colored plates.) M. Lombardo.

Focosi, M. The presence of volatile aromatic substances and the determination of their amount in blood serum. *Boll. d'Ocul.*, 1938, v. 17, May, pp. 337-349.

It is known that an extraordinary increase of aromatic substances is found in the blood of patients affected by some pathologic conditions. The writer mentions his method for determining the presence of phenols in the aqueous of rabbits, considers what importance these substances may have in the pathogenesis of certain ocular lesions, and mentions various types of lesion which are associated with increase or overproduction of these substances. Nephritic neuroretinitis manifests itself in subjects who show signs of renal insufficiency, and in such cases the blood shows a marked increase of phenols. It is possible that in these cases the ocular lesion is due to toxic action on the blood-vessel walls of the choroid and retina, so that the phenols might have importance in the pathogenesis of nephritic neuroretinitis. Pernicious anemia may show retinal changes possibly due to the same cause. A marked phenoluria is found in cases of colitis and the connection between the intestinal functions and ocular lesions of toxic origin is well known. Cataract fol-

lowing dinitrophenol intoxication may have a similar origin. (Bibliography.) M. Lombardo.

Galewska, Zofia. A case of echinococcus cyst of the orbit cured by X-ray treatment. *Klinika Oczna*, 1938, v. 16, pt. 6, p. 723.

A boy eleven years old suddenly developed loss of vision in the left eye with hemorrhages and opacities in the vitreous. A diagnosis of orbital echinococcus was made from hemotologic studies, and under X-ray treatment the fundus became normal and vision was regained. Ray K. Daily.

Green, John. Ocular manifestations in brucellosis (undulant fever.) *Arch. of Ophth.*, 1939, v. 21, Jan., pp. 51-65; also *Trans. Amer. Ophth. Soc.*, 1938, v. 36, p. 104.

After a brief historical account of undulant fever, the author discusses the diagnosis and therapy of this condition, reports four personal cases, and reviews all the cases in the available literature in which ocular complications occurred. Recently there has been developed an effective serum for the treatment of the disease in the acute stage and a vaccine for treatment in the chronic stage. The external ocular muscles, cornea, uveal tract, retina, and optic nerve have all proved vulnerable. However, enucleation can usually be avoided. Clinically as well as pathologically it seems to have a great similarity to ocular tuberculosis. (Discussion.)

J. Hewitt Judd.

Jacovidès. Ocular manifestations observed during the menopause. *Bull. Soc. Egypt*, 1937, v. 30, p. 174.

Three cases of ocular symptoms related to the menopause are reported. The first showed a distinct loss of

visual acuity. Examination revealed general hyperemia of the retina and optic nerve, with two macular hemorrhages. The patient had a slight elevation of blood pressure. At the end of two months treatment with ovarian extracts, rest, and restricted diet, the retinal circulation was normal, and at the end of four months the vision had returned to normal.

The second case showed distinct loss of vision following a hemorrhage during menstruation. The eyegrounds showed diminution in the caliber of the vessels with general ischemia of the retina and optic nerve, and a cherry-red macula. Rest in bed, with ovarian medication and a series of strychnine injections, restored the vision to normal within two months time.

The third case had bilateral accommodative asthenopia, with negative fundus findings except for slight hyperemia. Treatment consisted of restricted diet and folliculine injections. Within three weeks the symptoms had disappeared. Edna M. Reynolds.

Koch, F. L. P. Herpes zoster ophthalmicus. *Arch. of Opth.*, 1939, v. 21, Jan., pp. 118-120.

A case is reported because the patient was only 5½ years of age. This boy presented a typical clinical picture with dermatitis of the left lid, keratitis, ischemia of the disc with edema of the subjacent retina, and many exudates in the macular area. J. Hewitt Judd.

Louffy, M., Fahmy, A. R., and Ismail, D. Ocular manifestations of leprosy. *Bull. Opth. Soc. Egypt*, 1937, v. 30, p. 181.

The ocular findings in 293 cases of leprosy are listed. The eye signs are usually early and often aid in making

the diagnosis. Loss of the eyebrows with changes in color and falling of the cilia occurred very frequently (in 222 cases). Thickening of the supraciliary margin with nodular elevations of the skin of the lids was also common. Paralysis of the orbicularis occurred in 34 cases. *Lepra bacilli* were constantly found along the eyelid margin and were at times found in parts of the conjunctiva and cornea which appeared normal. Entrance is through the epithelium of the conjunctiva or cornea to the uvea, with consequent loss of sight.

Edna M. Reynolds.

Napoleoni, Valerio. Researches on the central and peripheral light sense in hepatic patients with and without icterus. *Arch. di Ottal.*, 1939, v. 45, Sept.-Oct., p. 258.

Using the adaptometer of Engelking and Hartung, the author tested the light sense in hepatic patients and discovered abnormal values only in those patients who showed icterus.

H. D. Scarney.

Sivko, M. T. Involvement of the optic nerve and retina in botulism. *Viestnik Opht.*, 1938, v. 13, pt. 6, p. 861.

A report of a case in which the ocular symptoms were paralysis of accommodation with normal pupillary reaction, lowered visual acuity, contracted field, and a relative peripheral ring scotoma. The fundus presented a picture similar to that of retrobulbar neuritis passing into atrophy. Recovery took place under retrobulbar injections of atropine.

Ray K. Daily.

Stroschein, E. *Filaria loa* in the eye. *Klin. M. f. Augenh.*, 1939, v. 102, Jan., p. 111.

A woman affected with filariasis

asked to have a filaria, whose movements she felt for a few minutes in her right lower lid, immediately removed without any preparation. Under the thin skin a fine linear elevation about 2 cm. long could be seen parallel to the lid margin. It showed lively movements. Through a 4-mm. incision a white filaria, 0.5 mm. thick and 40 mm. long, was extracted with iris forceps. After three months the patient had another filaria removed elsewhere. As filaria loa is viviparous, the young microfilarias circulate in the blood of the patient. If such a patient is stung by a blood-sucking insect, the latter becomes infected and propagates the parasite. Filaria loa is found only on the west coast of Africa, and is exclusively conveyed by flies of the species chrysops. C. Zimmermann.

Zaffke, K. H. Hemeralopia as a symptom of thyrotoxicosis and diseases of the liver. *Deut. Arch. f. Klin. Med.*, 1939, v. 183, pt. 4, pp. 433-447.

In 22 thyrotoxic individuals, dark-adaptation tests showed the presence of hemeralopia. It has been recently shown that in thyrotoxic individuals injury to the liver occurs, and since the liver is important for the storage of vitamin A, it is concluded that the thyrotoxic hemeralopia is the result of the thyrogenic injury to the liver. Hemeralopia was found to be present in five cases of cirrhosis of the liver and in seven cases of icterus from other causes such as catarrhal jaundice, congestion of the liver, and cholangitis. The degree of hemeralopia is dependent upon the amount of injury to the liver. In cirrhosis of the liver, hemeralopia occurs in such characteristic amount and form as to serve in differentiating cirrhosis of the liver from all other hepatic disorders. H. D. Lamb.

18

HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Beach, S. J. American ophthalmology grows up: turbulent years from 1908-1915. *Amer. Jour. Ophth.*, 1939, v. 22, April, pp. 367-373; also *Trans. Amer. Ophth. Soc.*, 1938, v. 36, p. 175.

Furniss, Austin. The school ophthalmic service. *Brit. Jour. Ophth.*, 1939, v. 23, April, pp. 256-272.

Basing his presentation on the fact that the eye and the ear are the chief gateways of learning, the author discusses in a lengthy article the ophthalmological service rendered by the school with which he is associated. The school deals with children over five years of age, while the health visitor checks the children under that age in their homes. Findings as to the vision in young children are presented, as are experiences with the Snellen test, examination, and treatment; myopia as found among the children of the school being given full discussion and description. Tables.) D. F. Harbridge.

Gutentag, Stanislaw. Schools for children with trachoma in Lodz. *Klinika Oczna*, 1939, v. 17, pt. 1, p. 113.

The author proves statistically the effectiveness of special schools, for children with trachoma, in eliminating the disease. In addition to providing treatment the schools take into consideration the child's visual abilities in setting up the curriculum.

Ray K. Daily.

Harman, N. B. The findings of eye examinations, 50,000 cases. *Brit. Med. Jour.*, 1939, Feb. 11, Supplement, pp. 65-66.

The results of examination of 50,000 unselected cases by the British Nation-

al Eye Service during the past five years are analyzed and presented in table form. Of this total, 63.65 percent showed errors of refraction only, 27.68 percent showed errors of refraction plus other eye conditions, 7.9 percent showed other eye conditions only, and 0.77 percent showed no appreciable defect. A discussion of the importance of good eyesight in industry concludes the article.

George A. Filmer.

Heinonen, O. Hereditary blindness and its prophylaxis. *Acta Ophth.*, 1938, v. 16, pt. 4, p. 535.

A survey of the incurably blind in Finland shows that in 25 percent of them the disease is hereditary. The author believes that the occurrence of several cases of hereditary blindness in successive generations justifies sterilization of the diseased. Compulsory sterilization of blind persons whose hereditary factor is recessive is neither effective nor desirable, because normal people carrying the recessive factors far outnumber those actually diseased.

Ray K. Daily.

Houwer, A. W. M. Peculiarities of well-known ocular diseases in the Netherland East Indies. *Arch. of Ophth.*, 1939, v. 21, Feb., pp. 235-238; also *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1938, 43rd mtg., p. 188.

The most prominent differences in behavior and frequency between the ocular diseases of Europeans and those of the natives are presented. Insufficient food of the poor natives is responsible for xerophthalmia, but racial, climatic, and other circumstances are probably responsible for differences in the incidence and course of cataract, trachoma, acute conjunctivitis, gonorrheal conjunctivitis and iritis, syphilis, tuberculosis, leprosy, and tumors of the

eye. It is pointed out that geographic ophthalmology promises to be an interesting science. J. Hewitt Judd.

Lavos, George. Waiving compensation rights. *Outlook for the Blind*, 1938, v. 32, Oct., p. 128.

Compensation laws have caused employers to become very selective in hiring workmen, and especially careful as to hiring those with obvious physical disabilities such as loss of an arm, a leg, or an eye. Six states have included compensation waivers in their workmen's compensation laws. In three of the states, Connecticut, Wisconsin, and Ohio, the waiver provides that compensation shall be given to the blind if the accident is not attributable to the blindness.

The author concludes that the effect of the waiver has not been too encouraging. Employment for a handicapped person depends on his individual competence, or, lacking this, takes the form of "sheltered employment such as stand concessions."

F. M. Crage.

Law, F. W. "Egyptian ophthalmia." *Brit. Jour. Ophth.*, 1939, v. 23, Feb., pp. 81-95.

First there is here presented a selection of comments appearing in the literature relative to opinions of various authorities as to the nature of the ophthalmia under discussion. Chief among these quotations is a lengthy letter over the signature of William Ferguson as written in November, 1809. This letter describes a spurious ophthalmia self-inflicted by soldiers to escape service in the Irish army, risking self-imposed blindness in order to draw a life pension and evade further army obligations. The author thereupon differentiates between the factitious ophthalmia described by Ferguson and the true dis-

ease with which Staff Surgeon Vetch was contending. The author concludes that it was undoubtedly from Egypt that the infection came which proved such a scourge in the European outbreaks referred to in the references in the forepart of the article. (References.) D. F. Harbridge.

Leydhecker, F. J. Contribution to the history of ophthalmology. The literary sources of Niden's reading tests. Graefe's Arch., 1939, v. 140, pt. 1, pp. 129-140.

Almost all the German eye physicians use the reading tests of Adolf Niden. Niden was born in 1846, was an assistant to Saemisch, and practiced ophthalmology in Bochum from 1847 until he moved in 1902 to Bonn, where he died in 1915. The first of his reading tests was published in 1882. In the present article, the author reveals the literary source of many of the brilliant and inspiring German quotations that Niden employed. H. D. Lamb.

Mettenheim, H. Reminiscences of Albrecht von Graefe, with ten letters from him. Klin. M. f. Augenh., 1939, v. 102, Jan., p. 117.

These letters and reminiscences were left by Carl von Mettenheimer, who was an assistant of Johannes Müller and a friend of Graefe. They are published by the recipient's son. The letters were addressed to von Mettenheimer and to G. Passavant.

C. Zimmermann.

Pickarski, Cz. The spread of trachoma and the fight against it in Italy. Klinika Oczna, 1939, v. 17, pt. 1, p. 119.

The prevalence of trachoma in Italy is very high, and it is on the increase, as shown by statistical data on candidates for military service. The activities

against trachoma are far below those in Poland. Ray K. Daily.

19

ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

Brodsky, Isadore. A description of a monster, *diprosopus tetrophthalmus*. Brit. Jour. Ophth., 1939, v. 23, April, pp. 250-256.

Brodsky reports the case of an uncommon monstrosity, the fetus of a white female. The external features are described and illustrated, a short description being given of the internal anatomy, and the microscopic appearance of the median eyes. Radiographic features, with reproductions of the radiographs, are also presented. The monster displayed an eye on each side of the head, which was in the nature of two heads in one, there being a central or median block containing two eyes. (Illustration.) D. F. Harbridge.

Hudelo, André. Histology of the choriocapillaris. Ann. d'Ocul., 1939, v. 176, March, pp. 186-190.

Careful microscopic studies confirm previous statements that vessel walls in the choriocapillaris are composed entirely of endothelial cells. The few intercapillary fibrils are not intimate parts of the walls. The idea that all the nuclei in these capillary walls are toward the sclera is not borne out.

John M. McLean.

Spyratos, Spyridon. Some contributions to the angioscopy of the eye. Klin. M. f. Augenh., 1939, v. 102, Jan., p. 35.

After withdrawing the blood from living rabbits under chloroform narcosis, the author injected the whole head with Kaiserling-Ceelen solution and made vertical and flat serial sections of the sclerocorneal region, using

for the histologic examination Pappenheim's panoptic staining. Two separate vascular systems, conjunctival and episcleral, were distinguished in these specimens. Both systems show different characters and courses. They approach the sclerocorneal margin, but do not unite to form a common net. The conjunctiva of the upper lid shows a superficial anastomosing plexus of fine vessels, and under this larger branches from which the fine plexus arises. Toward the retrotarsal fold and on the bulbar conjunctiva extends only the fine superficial plexus so that in the underlying loose connective tissue there is an avascular space. Toward the sclerocorneal margin the superficial system approaches the underlying episcleral anastomoses by thicker branches but they do not unite. The deep episcleral vessels have a straighter course, are wider than the conjunctival, and anastomose at the limbus to form a wide plexus. C. Zimmermann.

Volokonenko, A. I. Adult changes in human conjunctiva. *Viestnik Ophth.*, 1939, v. 14, pt. 1, p. 19.

Microscopic studies of conjunctiva at various ages show that conjunctival

morphology varies with the external environment. In intrauterine life the fibrous component of the conjunctiva consists of loose delicate collagenous bundles. After birth in response to external irritants a cellular infiltration appears in the subepithelial layer, and the number of argyrophile fibers increases, forming a complete layer under the basal membrane. The rapid development of fibers is made possible by the presence of large numbers of mesenchymatous cells which are endowed biologically with marked reactive ability. As these changes progress in the subepithelial layer the conjunctiva assumes an adenoid structure, and the adenoid tissue is very responsive to various irritants. The bulbar conjunctiva has but few argyrophile fibers and the subepithelial layer does not become adenoid; the adult changes are insignificant and confined mostly to the limbus. The transition folds contain the largest number of active elements, and therefore respond rapidly to comparatively mild irritants which produce no change in the bulbar conjunctiva. The senile change consists in the substitution of collagenous for argyrophile fibers.

Ray K. Daily.

NEWS ITEMS

Edited by DR. H. ROMMEL HILDRETH
640 S. Kingshighway, Saint Louis

News items should reach the Editor by the twelfth of the month

DEATHS

The death of Mr. Donald Gunn at an advanced age is noted. While the younger generation of ophthalmologists, no doubt, have not heard of Mr. Gunn, the older men in this practice remember him as noted in his field but self-effacing to a noticeable degree.

Dr. Harry Elmo Peterman, Baltimore, Maryland, died February 25, 1939, aged 67 years.

Dr. Edward Jay Bernstein, Detroit, Michigan, died March 30, 1939, aged 75 years.

MISCELLANEOUS

The staff of the Illinois Eye and Ear Infirmary, 908 West Adams Street, Chicago, Illinois, announces an intensive five-day course on glaucoma, which will begin on September 11, 1939.

The course will be limited to 10 physicians who are practicing ophthalmology, either with or without otolaryngology. Registrants will be accepted in the order of the receipt of their applications.

The course will last for five days, from 9:00 o'clock in the morning until 5:00 in the evening. Lunch will be included, during which a round-table discussion will be conducted. The course is designed to be of a practical nature. Only two hours a day will be devoted to lectures. Registrants will receive practical instruction and practice on patients in the different methods of diagnosis. Various types of surgery for glaucoma will be demonstrated by the attending staff, following which the registrants will practice the same operations upon kittens' eyes, under the supervision of the attending surgeon.

Each registrant must bring his own ophthalmoscope and, if available, his own tonometer. Other material will be supplied.

The fee for the course is \$75.00, payable at the time of the registrant's acceptance.

The Section on Ophthalmology of the College of Physicians of Philadelphia announces the S. Lewis Ziegler Prize. This is an award of one hundred dollars for the best piece of original work in ophthalmology accomplished in any one year from October 1st to September 30th, inclusive.

Descriptive reports to be submitted anonymously at the first meeting of the Section in October to duly appointed judges who shall make their award or report not later than December 31st of that year.

The interest only of this endowment fund when amounting to one hundred dollars shall constitute the prize.

The report or reports submitted shall in the discretion of the judges be of sufficient merit or importance to justify the award; otherwise,

the interest accruing above the requirement of one award shall be turned back to the principal sum.

The touring members of the Ophthalmological Society of the North of England were entertained by the staff of the Brooklyn Eye and Ear Hospital on May 1st to 4th. The program included surgical clinics, eyeground clinics, demonstration lectures, and pathology presentations. It was truly a pleasure to meet this fine representative body. Brooklyn eye men hope the group will be able to come again and spend a longer time with them.

The following symposium on visual fatigue was held by the National Research Council, 2101 Constitution Avenue, Washington, D.C., on May 20-21, 1939: Walter R. Miles, Laboratory of Physiological Psychology, Yale University School of Medicine, New Haven, Connecticut, The visual fatigue problem; George Wald, Biological Laboratories, Harvard University, Cambridge, Massachusetts, The chemical basis of visual adaptation; Clarence H. Graham, Psychology Laboratory, Brown University, Providence, Rhode Island, Frequency of nerve-impulse discharge as a function of time after onset of illumination; Selig Hecht, Laboratory of Biophysics, Columbia University, New York City, Relation between visual acuity and illumination; Brian O'Brien, Institute of Optics, University of Rochester, Rochester, New York, Iris measurements; P. G. Nutting, Jr., Research Laboratories Eastman Kodak Company, Rochester, New York, The influence of flicker fatigue on flicker frequency; Alfred Bielschowsky, The Dartmouth Eye Institute, Dartmouth Medical School, Hanover, New Hampshire, Influence of fatigue on the mechanism involved in binocular cooperation; Walter R. Miles, Laboratory of Physiological Psychology, Yale University School of Medicine, New Haven, Connecticut, Variations in the polarity-potential of the human eye; Frank K. Moss, Lighting Research Laboratory, General Electric Company, Nela Park, Cleveland, Ohio, Visibility and ease of seeing; Ross A. McFarland, Fatigue Laboratory, Harvard University, Soldiers Field, Boston, Massachusetts, The effects of anoxia on certain visual functions; Miles A. Tinker, Psychology Laboratory, University of Minnesota, Minneapolis, Minnesota, Visual fatigue in the reading of print; Walter F. Dearborn, Psycho-Educational Clinic, Harvard University, Cambridge, Massachusetts, On the relations of visual fatigue in reading disability; Robert K. Lambert, Eye Institute, Columbia University, New York City, The spasmogenic tendency and its effect on the eyes; Harry M. Johnson, Department of Psychology,

Tulane University, New Orleans, Louisiana, Rival motions of the nature of physiological impairment. This two-day conference was held at the suggestion of The Committee on Scientific Aids to Learning of the National Research Council.

The British Journal of Ophthalmology expresses its intention of establishing a bureau for the collection of case notes concerning retinal detachment. Mr. Charles Gordon will serve as chairman for the small committee contemplated while Mr. H. B. Stallard will act as secretary.

The American Optical Company has just published a booklet entitled "The ophthalmoscope and studies of the fundus oculi in important pathological conditions" which presents a series of fundus oculi studies, showing pathological changes from normal frequently encountered in diagnostic work.

The charts contained in the booklet were drawn by an artist in anatomy under the direct supervision of an ophthalmologist of wide reputation. They depict actual cases observed in one of the large medical centers.

Although the book is not intended, in any sense, to be a treatise on ophthalmoscopy, the company hopes that the skill and fidelity with which the artist has depicted a number of common diseases in their incipient stages and the clarity with which the author has described these fundamental conditions will prove helpful.

The American Optical Company presents this study as an interesting contribution to current literature on ophthalmoscopy. Copies can be obtained free of charge from the company.

SOCIETIES

At the regular business meeting of the Washington Ophthalmological Society on March 6, 1939, the following men were elected to office for the year 1939-40: president, Dr. Ernest Sheppard; vice-president, Dr. Frank D. Costenbader; secretary-treasurer, Dr. E. Leonard Goodman; executive committeeman, Dr. L. Conner Moss.

At the meeting of the Society on April 10, 1939, the following nationally known ophthalmologists addressed the members and guests: Dr. W. L. Benedict of the Mayo Clinic, on Lesions of the eyeball following operation on the Gasserian ganglion for relief of trifacial neuralgia; Dr. Walter B. Lancaster of Boston, on The management of a case of glaucoma; Dr. John Green of St. Louis, on Ocular manifestations of undulant fever.

At a recent meeting of the Buffalo Ophthalmologic Club the following officers were elected: president, Dr. James C. Fowler; vice-president, Dr. Meyer H. Riwchun; secretary-treasurer, Dr. Cheldon B. Freeman.

A general assembly of delegates and of all members of the International Organization against Trachoma, of which due notice had

been given, was held at the Royal Society of Medicine, 1 Wimpole Street, London, on April 21, 1939.

There were present: Drs. MacCallan (president), Wibaut (secretary-general and treasurer), Nordenson and Pfluger (International Council of Ophthalmology), Goodman (League of Nations), Bailliart (International Association for the Prevention of Blindness, also representing France), de Grosz (representing Hungary), Gradle (representing the United States of America), Lauber and Melanowsky (representing Poland), Rohrschneider (representing Germany), Maggiore (representing Italy), Khalil, El Kattan, and Tahir (representing Egypt).

The minutes of the last meeting held in Cairo in December, 1937, were read and approved.

The accounts were examined and approved.

The new statutes, a draft of which had been previously sent to every delegate and member, were approved.

It was decided that the president and secretary-general should remain in office until the next Concilium Ophthalmologicum, when an election will be held to fill these offices and those of members of the council.

A discussion of importance by many members of the assembly took place. It was decided to delegate Dr. MacCallan to write a *brochure* on the subject of trachoma destined for general practitioners in trachomatous countries. Dr. Gradle suggested that the cost of the necessary illustrations might be borne by certain corporations which he proposed to interest in this project.

The next meeting of the council of the organization was decided on: this will be held in Paris at the same periods as those of the International Council of Ophthalmology and of La Société Française d'Ophthalmologie.

The next scientific meeting of the organization will be held during the period of the next Quadrennial Congress of the International Ophthalmological Congress in Vienna, in 1941.

The eighteenth annual scientific and clinical session of the American Congress of Physical Therapy will be held September 5, 6, 7, 8, 1939, at the Hotel Pennsylvania, New York City. Preceding these sessions the Congress will conduct an intensive instruction seminar in physical therapy for physicians and technicians—August 30th to September 2d.

PERSONALS

McGill University announced the appointment of S. Hanford McKee, Professor of Ophthalmology, in charge of the department.

Dr. Thomas Hall Shastid, Duluth, Minnesota, who has been confined to bed for more than eight months by a very severe attack of multiple neuritis, is beginning to show improvement. He expects to be up and back at work again in about two months.

AMERICAN JOURNAL OF OPHTHALMOLOGY

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THE USE OF SULFANILAMIDE COMPOUNDS
IN OPHTHALMOLOGY*

JACK S. GUYTON, M.D.

Baltimore, Maryland

The addition of sulfanilamide compounds to chemotherapy is probably the greatest advance in medicine for many years. These drugs have already been tried in the treatment of many inflammatory ocular diseases. In ophthalmology, they have proved especially effective in the treatment of gonococcal conjunctivitis and trachoma. The purpose of this paper is to review the present status of this relatively new form of chemotherapy and to add to the already existing reports a digest of its use in ophthalmology.

PRESENT STATUS IN GENERAL MEDICINE

During the past four years more than 1,000 sulfanilamide compounds have been prepared. Two of these compounds, sulfanilamide and sulfapyridine, produce the full therapeutic effects attainable by the use of all other preparations of this group. Only a very few of the other preparations are worthy of mention.

SULFANILAMIDE

Although it was not the first to be studied, sulfanilamide^{1, 2, 3, 4} (p-aminobenzenesulfonamide), produced under the names "Prontylin," "Septoplax," "1162 F," "Prontosil album," and others, is the parent stem from which all the other compounds in this group are derived.

Sulfanilamide is a white crystalline

substance, soluble to approximately 0.8 percent in water or normal saline solution at body temperature. It is readily and completely absorbed when given by mouth and reaches its maximum concentration in the blood⁵ approximately four hours after ingestion. The blood concentration then diminishes rapidly and reaches zero within about 24 hours after the administration of a single dose. A relatively small, but quite variable, proportion of the drug is converted within the body into acetylsulfanilamide. This compound behaves in essentially the same way as does sulfanilamide except that it is inactive against infectious agents. The "total" concentration of sulfanilamide is the concentration of the "free" or unchanged form plus the "acetylated" form. The proportion which is acetylated after oral ingestion varies widely in different animals, being rather high in guinea pigs and rabbits, lower in mice and humans (averaging around 15 percent in the latter), and zero in dogs. Sulfanilamide is one of the most diffusible substances known. It attains a concentration in the spinal fluid, ascitic fluid, exudates, and the aqueous⁶ closely paralleling that in the blood. Excretion of sulfanilamide takes place principally through the kidneys, and varies almost directly with the excretion of water. If the urinary function is seriously impaired, repeated doses will cause a cumulative rise in the blood concentration.

*From the Wilmer Ophthalmological Institute of the Johns Hopkins University and Hospital.

Sulfanilamide may be administered parenterally in concentrated solution with no ill effects. It should be dissolved in normal saline solution or, better still, in one-sixth molar sodium-lactate solution. Oral administration is preferable, but the subcutaneous route may be used.

The chemotherapeutic effect of sulfanilamide is now generally believed to be due solely to its bacteriostatic effect on certain infectious agents without depression or other alteration of the normal immune reactions of the body against the infection. The mode of action of sulfanilamide appears to be essentially the same *in vivo* and *in vitro*. When a growth of susceptible bacteria is subjected to sulfanilamide in an effective concentration, the bacteria multiply normally during the first several hours. The bacterial growth is thereafter greatly slowed down, although the organisms remain viable and capable of normal growth if removed from the sulfanilamide. An extremely high concentration of sulfanilamide, beyond that attainable *in vivo*, is necessary to produce any bactericidal effect. Sulfanilamide has no effect upon the toxin-producing capacity or virulence of organisms, nor does it produce an alteration of the strain. Several investigators have reported that sulfanilamide produces a change in the capsules of streptococci (and sulfapyridine in the capsules of pneumococci), but this effect has been disputed by many others.⁴ The clinical outcome of an infection susceptible to sulfanilamide depends upon the ability of the immune forces of the body to overcome the infection after it has been slowed down by the use of the drug.

With proper precautions, a blood-sulfanilamide concentration of approximately 10 mg. percent (1:10,000) may be maintained in humans with comparative safety for a considerable number of days. This concentration is effective

against all the infections that can be treated with clinical success. A higher concentration has no greater effect, and is more dangerous to the patient. In many infections, a lower concentration is equally effective. An approximate blood-sulfanilamide concentration may be reached and maintained by the oral administration of a given dosage on the basis of body weight, provided the renal function is normal. If the fluids are limited to 3,000 c.c., the ingestion of 0.07 gm. per kg. body weight will usually produce a blood level of 10 to 15 mg. percent within about four hours in the adult. This level can be maintained with 0.10 gm. per kg. per day, divided into six doses given at 4-hour intervals. In children, proportionately more is required because of the proportionately greater fluid intake. About twice the above dosage per kg. is required in babies. This scheme of dosage is desirable for severe infections that require prompt and maximum treatment. Approximately three fourths of the maintenance dosage listed above will produce and maintain a blood concentration of from 5 to 10 mg. percent within one or two days. This is quite adequate for those infections in which speed is not of prime importance.

Sulfanilamide in a concentration of 10 mg. percent is quite effective against infections caused by most of the aerobic streptococci³ (but not by most of the anaerobic group), by meningococci,⁷ gonococci,^{8, 9, 10} and by *B. welchii*.⁴ It is probably effective, at least to some degree, against those due to *Br. melitensis* and abortus,¹¹ *B. Friedlander*,¹ *H. influenzae*,³ and to actinomycosis.¹² There is rather good clinical evidence of its effectiveness against lymphogranuloma inguinale,^{13, 14} supposedly a virus disease. Evidence of its effectiveness against the virus of canine distemper^{15, 16} is not convincing. It is very slightly active against

most strains of pneumococci,⁴ but has little clinical value in these infections. Concentrations of 10 mg. percent are inactive *in vitro* against staphylococci and the gram-negative typhoid, paratyphoid, and enteric group of organisms,³ although some clinical reports suggest activity against these organisms.¹ It radically alters the course of experimental tuberculosis in guinea pigs,¹⁷ but appears to be ineffectual clinically. A few unconvincing successes have been claimed in the treatment of bubonic plague and malaria.¹ It is ineffective in pertussis and rheumatic fever.¹ It is inactive against any of the neurotropic and respiratory groups of viruses, although it may favorably influence the secondary infections commonly associated with them.¹

Sulfanilamide appears in the urine in much higher concentrations than can be attained in the blood. It is effective against urinary-tract infections due to staphylococci, *B. coli*, *B. aerogenes*, and to *Proteus*.⁴

The excretion of sulfanilamide by the kidney is accompanied by loss of fixed base. Approximately half as much sodium bicarbonate as sulfanilamide should therefore be administered as prophylaxis against acidosis. Some degree of cyanosis develops in almost all patients given large amounts of sulfanilamide. This is due in part to the formation of methemoglobin, but is probably mainly due to the production of an as yet unknown pigment.¹⁸ This cyanosis will promptly disappear with the administration of about 10 c.c. of 1-percent methylene blue intravenously, but it may be safely disregarded. Dizziness, anorexia, nausea, vomiting, and mild, slowly developing hemolytic anemia are quite common. These form no indication against continuing sulfanilamide. An unexplained abrupt rise in temperature or leucocyte count, especially during the first week,

form an important indication for stopping sulfanilamide. These signs are often rapidly followed by acute hemolytic anemia,^{19, 20} severe dermatitis,²¹ or both. Fortunately these reactions occur in less than 10 percent of patients receiving large doses of the drug.⁴ There is very little danger from them if the drug be promptly stopped, fluids forced, and transfusions utilized when necessary. Patients exhibiting these reactions will probably have a recurrence if the drug is started again. Very rarely, agranulocytosis develops, usually after a prolonged period of treatment. Some of these patients die, but the majority survive. One case of toxic hepatitis²⁰ and one case of retrobulbar neuritis²² have been reported. On the whole, sulfanilamide is a relatively safe chemotherapeutic drug.

SULFAPYRIDINE

Sulfapyridine (2- (p-aminobenzene-sulfonamide) pyridine), "M & B. 693," was first introduced²³ on May 28, 1938. It is a white crystalline compound, soluble in water only to about 1:1000. It is absorbed quite irregularly from the intestinal tract. The same oral dosage may produce a blood concentration of from 1 to 18 mg. percent in different individuals.²⁴ The degree of acetylation in the human body appears to be slightly greater and more variable than is the case with sulfanilamide. This drug was at first reported to be less toxic than sulfanilamide, but it has now been shown that, on the basis of blood concentrations, it is slightly more toxic.²⁵ The toxic effects are essentially the same in character as those of sulfanilamide,^{12, 26} except that acidosis is not produced. The administration of sodium bicarbonate is therefore unnecessary. The soluble sodium salt of sulfapyridine has very recently been prepared. It has a pH of 10.4 in 1-percent solution, and is hence somewhat irritating.

Sulfapyridine possesses the characteristic of being quite effective, both experimentally and clinically, against pneumococcus infections.^{23, 24, 27} It has also come into increasing usage in the treatment of gonorrhea.^{28, 29, 30} The statistics at present available indicate that it is probably more effective in the treatment of gonorrhea than is sulfanilamide. Several clinical reports of its successful use in generalized staphylococcal infections have appeared,^{31, 32, 33} but they are not entirely convincing. Experimentally, its action against this group of organisms is rather slight. It has also been successfully used in most of the other infections susceptible to sulfanilamide. Sulfapyridine is usually given in dosage roughly equivalent to that of sulfanilamide. The sodium salt can be injected intravenously very slowly in 5-percent solution³⁴ or given by rectum in 2-percent solution.²⁴

PRONTOSIL AND NEOPRONTOSIL

The prontosils consist of a group of related compounds going under the same name. Certain of these compounds are readily soluble. All consist of a sulfanilamide radical joined to an azo radical, which usually imparts a red color to the compounds. These compounds have no bacteriostatic action *in vitro*. Within the body they are broken down with the liberation of the sulfanilamide radical, which is the principal active chemotherapeutic agent. Unfortunately, sulfanilamide has sometimes been called "Prontosil album." This has led to some confusion in the literature.

ULIRON

Uliron (di-methyl-di-sulfanilamide) is the most widely used drug in Germany for the treatment of gonorrhea. It possesses no advantages over sulfanilamide or sulfapyridine, but possesses the dis-

advantage of often causing a severe peripheral neuritis.

SEPTASINE

Septasine (benzylaminobenzenesulfamid) has been used extensively in France and to some extent in England for streptococcus infections. It possesses no advantages over sulfanilamide, and does not have so wide a range of effectiveness.

REVIEW OF OPHTHALMIC LITERATURE

The first reports of sulfanilamide compounds in connection with ophthalmology appeared in August, 1937, when Hageman³⁵ and Heineman³⁶ each reported a case of gonococcal conjunctivitis treated successfully with sulfanilamide. Thirteen subsequent reports of the use of sulfanilamide compounds in gonococcal conjunctivitis have appeared in the literature. A summary of the results obtained by each author is given in chart 1.

A total of 104 cases of gonococcal conjunctivitis treated with sulfanilamide compounds has been reported. The results have been uniformly dramatic, except in those patients treated with very small doses of uliron. A marked effect on the course of this disease is exerted by very small doses of sulfanilamide, but the results are more satisfactory when larger doses (maintaining a blood concentration of 5 to 10 mg. percent) are used. If adequate chemotherapy be given, almost all patients can be expected to exhibit a clinical and bacteriological cure within one to four days. Sulfanilamide should be continued for some time after the first negative smear, in order to prevent recurrences (approximately 10 days is probably adequate). Almost no complications or recurrences should take place. Local irrigations may be of value until the discharge ceases, but no other

CHART 1

RESULTS OF TREATMENT OF GONOCOCCAL CONJUNCTIVITIS WITH SULFANILAMIDE COMPOUNDS

Author	Number of Cases	Drug Used	Average Expected* Blood Level	Remarks	Results of Chemotherapy
Hageman ³⁵	1	Sulfanilamide	Dosage not stated	Details not given	Negative smear within 36 hours
Heineman ³⁶	1	Sulfanilamide	Dosage not stated	Details not given	Rapid cure
Newman ³⁷	8	Sulfanilamide	5 mg. %	Usual local treatments. Progress unsatisfactory in all before starting sulfanilamide	Remarkable improvement within one day. Negative smears in all within 6 days
Thayer ³⁸	5	Sulfanilamide	7 mg. %**	Saline or boric irrigations locally	Rapid improvement in all within 36 hours. Negative smears and cultures after this time
Dollfus et al ³⁹	3 3	Sulfanilamide Di-(p-acetylaminophenyl) sulfone	3 mg. %	Usual local treatments	Marked improvement in all within 2 days. One recurrence after 11-day course of treatment. Satisfactory response to a second course
Magitot et al ⁴⁰	5	Sulfanilamide	5 mg. %	No local treatments	3 cases clinically cured, with negative smears, within 3 days. 1 case markedly improved when drug was stopped after 2 days. 1 recurrence after stopping drug. Satisfactory response to a second course
Pages et al ⁴¹	3	Sulfanilamide	6 mg. %	Protargol locally twice daily	Negative smears in all within 4 days
Sourdille ⁴²	1	Di-(p-acetylaminophenyl) sulfone	5 mg. %		Negative smear within 5 days
Slobozianu ⁴³	5	Uliron	Very small dosage	Irrigations and silver preparations locally	2 cases cured within 5 days. 3 cases cured within 7 to 18 days
Dik ⁴⁴	23	Uliron	Very small dosage	Details not given	Many reacted favorably. Some failures
Fernandez and Fernandez ⁴⁵	8	Sulfanilamide	2 mg. %	All cases unilateral. Usual local treatments in all except 2 cases	Clinical cures in all within several days, but positive smears or cultures for an average of about 10 days. One recurrence after 3 day course of treatment. Satisfactory response to a second course
Miehie and Webster ⁴⁶	2	Sulfapyridine	4 mg. %	Usual local treatments. Progress unsatisfactory before starting sulfapyridine	Negative smears within 2 and 4 days. (Compared with an average of 49 days for 10 control cases)
Miehels ⁴⁷	15	Sulfanilamide	2 to 5 mg. %**	Usual local treatments	Hospitalized an average of only 5.8 days. (Compared with 28.5 days for a control series of 32 cases)
Glover ⁴⁸	2	Sulfanilamide	2 mg. %	"Prontosil" locally every $\frac{1}{2}$ hour	Negative smears within 3 and 4 days
Bower and Frank ⁴⁹	21	Sulfanilamide	6 mg. % in adults 3 mg. % in infants	Dosage reduced to $\frac{1}{2}$ within 3 days. Usual local treatments	Negative smears in 18 cases within an average of 2 days. Recurrences in 2 infants after 7-day courses of treatment. Only one responded to a second course. Relapse in 1 infant with reduction of dosage after 3 days treatment

* These approximate values are calculated from dosages of the drug given by mouth.

** Blood sulfanilamide levels were actually determined.

local treatment appears to be necessary. The relative value of the various sulfanilamide derivatives remains to be proved.

The use of sulfanilamide compounds in trachoma was first reported by Heineman³⁶ in August, 1937. He treated one

case of trachoma with "Septasine" and two others with sulfanilamide. He stated that the results were so brilliant that they reminded him of the first chemotherapeutic results obtained with salvarsan and with emetine. Five large series of

trachoma patients treated with sulfanilamide have subsequently been reported. The results obtained by each author are summarized in chart 2.

In all, about 250 cases of trachoma treated with sulfanilamide have been reported. The results have been uniformly excellent. It is probably necessary to maintain a blood level of at least 3 mg. percent for about three weeks in order to

ment. However, its effects appear to be neither so rapid nor so extensive as those observed with the use of sulfanilamide.

Thygeson⁵⁵ has reported a case of inclusion conjunctivitis in a 34-year-old female treated with sulfanilamide. Dosage of 2 gm. per day was given for 21 days. Inclusion bodies disappeared after the second day of treatment, and a clinical cure was obtained within 13 days.

CHART 2
RESULTS OF TREATMENT OF TRACHOMA WITH SULFANILAMIDE

Author	No. of Cases	Average Expected Blood Level*	Average Duration of Treatment	Results	Remarks
Lian ⁵⁰	30	1 mg. %	14 days	Remarkable clearing of conjunctival inflammation, conjunctival thickening, and corneal complications (except for scarring). Very little effect on follicles. Prevention of recurrences	Advised mechanical treatment for follicles
Loc ⁵¹ Gradle**	140) 41}	3 to 4 mg. %	24 days	Subjective improvement within 24 hours. Paling of conjunctiva within several days. Considerable clearing of pannus after 8 to 15 days. Gradual flattening of granules and follicles after a variable period. No effect on old corneal scars	All stages of trachoma. No other treatment necessary
Dik ⁴¹	Not stated	1 mg. %	Not stated	Similar to those of Lian	
Hirschfelder ⁵²	25	3 to 4 mg. %	14 days	Similar to those of Loc except that no benefit was observed in very early follicular cases (which the author called border-line cases of follicular conjunctivitis)	

* These approximate blood sulfanilamide levels are calculated from dosages given by mouth.

** These cases were reported in a discussion of Loc's paper.

obtain optimum results, especially with regard to the disappearance of follicles.

For purposes of comparison, results of the treatment of trachoma by intravenous tartar emetic may be mentioned. Derkac⁵³ in September, 1937, first reported 50 cases treated in this way, and Julianelle⁵⁴ the following year reported 40 more cases. Intravenous tartar emetic proved quite beneficial, especially with regard to resorption of corneal infiltrates, disappearance of pannus, and diminution of papillary hypertrophy. Derkac found the use of additional local therapy quite beneficial. Julianelle found grattage a necessary adjunct in cases with follicular hyperplasia. This form of therapy is a distinct advance over older types of treat-

There was no recurrence after two months.

Kleefeld⁵⁶ reported 25 cases of dendritic keratitis treated with "Prontosil." Widely varying dosage was used. He thought there was a definite beneficial effect, but his results are not conclusive.

Lamers⁵⁷ reported seven cases of herpes zoster (no eye lesions mentioned) treated with small doses of prontosil internally and a Prontosil solution locally. Almost complete cures resulted in all cases within two to four days. This report is not entirely convincing, but bears further consideration.

Harry⁵⁸ reported four cases of "panophthalmitis" treated with very small doses of sulfanilamide. An actual pan-

ophthalmitis probably did not exist in two of these patients. In the other two, a purulent condition was undoubtedly present, but these resulted in phthisis bulbi. Butler⁵⁹ reported a case of sub-acute endophthalmitis which gradually developed about one month after cataract extraction. Sulfanilamide was administered in very small dosage (1.2 gm. per day). The ocular inflammation slowly subsided.

Goldenburg⁶⁰ reported a case of probable cavernous sinus thrombosis which recovered with prontosil therapy.

Thiers⁶¹ reported a case of "gonorrheal" iritis which was treated with relatively small doses of a sulfanilamide derivative for 17 days. The patient had had three previous attacks. Improvement began on the second day of chemotherapy, and there were no recurrences during the next six months.

Heinz⁶² reported a case of endophthalmitis following cataract extraction. The eye improved following the subconjunctival injection of 0.75 c.c. of prontosil solution three times during the course of a week.

Glover⁴⁸ reported a group of cases with various ocular inflammations treated mainly by local instillations of prontosil solution. The results sound quite good. However, it must be remembered that the prontosils are inactive against infectious agents until they are broken down, somewhere within the body, with the liberation of sulfanilamide. This theoretical objection cannot be applied to the local use of sulfanilamide solution itself. The local use of sulfanilamide solution has considerable potential value if it be administered sufficiently often to maintain an adequate concentration at the site of infection. Rambo¹⁶ has shown that a concentrated solution of sulfanilamide produces no irritation when it is dropped into the conjunctival sac or is injected

into the anterior chamber, and produces only slight irritation when it is injected into the vitreous. He also demonstrated that injection of sulfanilamide into the anterior chamber of rabbits is effective in preventing infection of the anterior segment of the eye by streptococci. The local use of sulfanilamide does not appear to be necessary in the treatment of those infections susceptible to enteral therapy. However, it may prove of considerable value in the treatment of infections that are susceptible only to higher concentrations of sulfanilamide than can be attained by internal administration, such as those due to staphylococci.

Bucy²² observed a 16-year-old patient who, on two occasions, developed certain toxic reactions soon after starting on a course of sulfanilamide. After a third test dose of only 0.3 gm., she developed a severe optic neuritis which disappeared within three days. This is the only toxic ocular manifestation of the sulfanilamide compounds yet reported.

REPORT OF CASES

During the past two-and-one-half years 43 patients have been given sulfanilamide compounds in the Johns Hopkins Hospital because of ocular inflammations. Most of these patients were hospitalized during all or part of the treatment. The drug was usually given in divided doses every four to six hours. All of those patients receiving sulfanilamide also received from a half to an equal dosage of sodium bicarbonate. The hemoglobin was determined every one to two days and the red and white blood counts every two to four days. The temperature was taken every 4 hours, and the carbon-dioxide combining power of the blood was estimated at varying intervals. Blood-sulfanilamide levels were determined, in all but a few

CHART 3
CASES OF "GONOCOCCAL" UVEITIS TREATED WITH SULFANILAMIDE

Case Number	Age years	Number of Previous Attacks	Day of Attack on which Therapy Began	Days of Sulfanilamide Therapy	Average Blood Level	Course of Uveitis after Beginning Sulfanilamide	Duration of Observation after this Therapy Ended	Number of Subsequent Attacks
1	51	1	25	20	8 mg. %	Began to rapidly subside after 10 days of therapy	13 months	1
2	42	6	5	24	5 mg. %	Began to slowly subside after 10 days of therapy	14 months	1
3	47	4	10	34	4 mg. %	Began to subside rapidly after 2 days of therapy	2 months*	1
4	33	9	10	35	7 mg. %	Already subsiding when therapy was begun. Continued to subside slowly	1 month	0
5	22	0	10	4	6 mg. %	Began to subside the day therapy was begun	19 months	0
6	32	0	35	8	4 mg. %	Already subsiding when therapy was begun. Continued to subside slowly	13 months	1
7	47	4	4	10	5 mg. %	Began to subside slowly after 7 days of therapy	19 months	1
8	54	0	120	7	8 mg. %	Continued unabated during the period of treatment	2 weeks	0
9	36	0	21	8	5 mg. %	Already subsiding when therapy was begun. Continued to subside slowly	None*	0
10	54	1	7	6	5 mg. %	Already rapidly subsiding when therapy was begun. Continued to subside	21 months	0
11	33	1	14	11	6 mg. %	Began to subside before therapy was begun. Continued to subside	12 months	2
12	41	1	72	49	10 mg. %	Gradually subsided during this course of therapy	1 month	1
13	46	many	indefinite	7	4 mg. %	Continued unabated during the period of treatment	16 months	0
14	64	many	indefinite	7	7 mg. %	Subsided soon after beginning therapy	12 months	1

* Patient treated more than one year ago, but disappeared from observation.

cases, every one to four days. Ten of these 43 patients developed toxic reactions of sufficient severity to warrant withdrawal of the drug, but no reaction was observed that did not subside satisfactorily after discontinuance of the drug.

GONOCOCCAL UVEITIS

Fourteen cases of probable gonococcal uveitis were treated. The diagnosis of gonococcal uveitis is always subject to some question,⁶³ for, as far as can be ascertained, the gonococcus has never been cultured from an eye with a simple uveitis. The diagnosis of these cases must

therefore be based on a history of gonorrhea, a positive blood gonococcus complement-fixation reaction, the exclusion of other foci of infection, and the clinical appearance of the uveitis. The onset of inflammation in these cases was usually abrupt and acute. In all except one case, the inflammation was limited to the anterior part of the uveal tract and was usually characterized by massive exudation of fibrin into the anterior chamber and by very fine cellular precipitates on the back of the cornea. A summary of each of these cases is given in chart 3.

An accurate estimate of the value of any form of therapy in the treatment of

uveitis can be made only by statistical analysis of a large number of adequately controlled cases. However, certain inferences of negative value may be obtained from these 14 cases. Primarily, improvement of the uveitis under sulfanilamide therapy did not begin at any regular interval after institution of the chemotherapy, and there was no improvement which could not have been reasonably expected without the use of sulfanilamide. The duration of the inflammation was not less, in general, than the duration of other attacks in which the patient was not treated with sulfanilamide. In the second place, out of the eight patients who had a history of previous attacks of uveitis, and who were treated with sulfanilamide more than one year ago, recurrences have already taken place in six, and one other had an active uveitis when last seen. From these facts one may infer that sulfanilamide is not of significant value in gonococcal uveitis, either from the viewpoints of immediate therapy or the prevention of recurrences.

During the past three years six patients with similar cases of uveitis have been treated with induced hyperpyrexia (including three reported above who also received sulfanilamide). In five of these the result was dramatic, the uveitis sub-

siding entirely almost overnight. All of these patients had had previous attacks, and out of the five treated more than one year ago there have been recurrences in only two.

OCULAR TUBERCULOSIS

Five cases of bilateral ocular tuberculosis are included in this series. The diagnosis was based on history, clinical appearance, cutaneous hypersensitivity to tuberculin, and exclusion of other foci of infection.⁶⁴ All of the patients had lesions quite typical of tuberculous ocular disease. A summary of these cases is given in chart 4.

In two of these five patients the inflammation subsided somewhat during the course of treatment, but recurred later. In two other patients there was no appreciable change in the inflammation during the period of therapy. In the fifth patient a typical scleritis developed in the second eye while the patient was under treatment. Sulfanilamide cannot be said to have exerted a beneficial effect in any of these patients with ocular tuberculosis.

PURULENT ENDOPHTHALMITIS AND PAN-OPHTHALMITIS

Seven patients with purulent endoph-

CHART 4
CASES OF OCULAR TUBERCULOSIS TREATED WITH SULFANILAMIDE

Case Number	Age years	Type of Lesion	Duration of Disease before Therapy Began	Degree of Active Inflammation at Onset of Therapy	Days of Sulfanilamide Therapy	Average Blood Level	Results
15	49	Uveitis and keratitis	8 years	Moderate	49	11 mg. %	Uveitis partially subsided. Recurred 9 months later
16	38	Uveitis, scleritis, and keratitis	10 years	Moderate	7	10 mg. %	Inflammation partially subsided. Recurred 2 months later
17	52	Uveitis	2½ years	Severe	14	5 mg. %	Uveitis continued unabated
18	38	Scleritis (in one eye only)	3 months	Moderate	16	10 mg. %	Scleritis developed in other eye 6 days after beginning therapy
19	65	Uveitis	18 days	Moderate	8	3 mg. %	Uveitis continued unabated. One eye became phthisical

thalmitis and panophthalmitis were treated with sulfanilamide. Diagnosis in each case was based on a history of possible intraocular infection and the presence of definite purulent exudate within the eye. A summary of these cases is given in chart 5.

Five of the purulent intraocular infections in this series occurred following cataract extraction. In two of these the

from the anterior chamber. This case appeared quite hopeless before chemotherapy was begun. The second of these, in which the organism within the eye was not cultured, but in which a pure culture of hemolytic *Staphylococcus aureus* was obtained from the conjunctival sac, also appeared utterly hopeless before sulfanilamide therapy was begun. The third, in which the infection was

CHART 5

CASES OF PURULENT ENDOPHTHALMITIS AND PANOPHTHALMITIS TREATED WITH SULFANILAMIDE

Case Number	Age years	Pathogenesis	Bacterial etiology	Days of sulfanilamide Therapy	Average Blood Level	Results
20	78	Occurred 5 days after intracapsular cataract extraction	Undetermined*	6	8 mg. %	Globe destroyed
21	44	Occurred 5 weeks after intracapsular cataract extraction	Pneumococcus	3	8 mg. %	Eye eviscerated after 3 days of therapy
22	77	Present 3 days after simple linear cataract extraction	Beta hemolytic streptococcus	20	5 mg. %	Cleared progressively after 4 days of therapy. Final vision 20/40
23	66	Present 4 days after intracapsular cataract extraction	Undetermined**	12 then 10	10 mg. % 5 mg. %	Inflammation unabated for 6 days. Eye then cleared rapidly, a red reflex first appearing after 13 days of therapy. Final result excellent
24	73	Occurred 5 days after extracapsular cataract extraction	Undetermined	7	10 mg. %	Cleared rapidly and progressively after 2 days of therapy
25	38	Followed intraocular foreign body	Undetermined	4	5 mg. %	Eye enucleated after 2 days of therapy
26	32	Followed corneal ulcer	<i>B. pyocyaneus</i>	5	10 mg. %***	Globe destroyed. Later enucleated
27	13	Occurred 3 days after onset of meningococcus meningitis	<i>Meningococcus</i> (?)****	20	11 mg. %	Cleared rapidly and progressively after 2 days' therapy. Final vision 20/20

* Hemolytic *Staphylococcus aureus* and Koch-Weeks bacillus in conjunctival sac.

** Hemolytic *Staphylococcus aureus* in conjunctival sac.

*** Sulfanilamide solution (0.8 percent) also instilled locally every 2 hours.

**** No cultures taken from the eye.

globe was destroyed, in spite of sulfanilamide therapy. Hemolytic *Staphylococcus aureus* and the Koch-Weeks bacillus were cultured from the conjunctival sac of one of these patients. Pneumococci were found in bacterial stains of sections from the eye in the second case. The other three patients recovered completely under intensive treatment with sulfanilamide. In one of these cases beta hemolytic streptococci were grown in pure culture from purulent exudate aspirated

entirely intraocular, was less severe, but recovery appeared to be more dramatic than would reasonably have been expected without the use of sulfanilamide. One patient with endophthalmitis following a perforating injury became worse in spite of moderate doses of sulfanilamide, and enucleation was performed two days after the drug was started. In one case of *B. pyocyaneus* panophthalmitis, beginning as a corneal ulcer, sulfanilamide had no appreciable effect. One pa-

tient with metastatic meningococcal panophthalmitis recovered dramatically with sulfanilamide therapy. This patient, treated two years ago, was probably the first ever to recover completely from this type of intraocular infection.

EXTRAOCULAR INFECTIONS

Five patients with infections of the lids or orbit were treated with sulfanila-

sulfanilamide, and all healed completely within several days.

TRACHOMA

Two patients with trachoma were treated with sulfanilamide. The diagnosis was based on the history and clinical appearance. No inclusion bodies could be found in either case. Both patients had an old chronic trachoma with only mod-

CHART 6
CASES OF INFECTION OF THE LIDS OR ORBIT TREATED WITH SULFANILAMIDE

Case Number	Age years	Type of Inflammation	Bacterial Etiology	Days of Sulfanilamide Therapy	Average Blood Level	Surgical Treatment	Results
28	24	Abscess of upper lid following a styne	Beta hemolytic streptococcus	4	2 mg. % (?) [*]	Incision and drainage	Temperature normal within 24 hours. Rapid healing
29	38	Abscess of upper lid following traumatic laceration	Beta hemolytic streptococcus and hemolytic Staphylococcus aureus	7	8 mg. %	None	Streptococci disappeared within 3 days. Uneventful healing within 7 days
30	31	Infection of socket following enucleation	Beta hemolytic streptococcus	4	10 mg. %	None	Complete healing within 2 days. Cultures sterile within 4 days
31	3	Purulent panophthalmitis following injury	Beta hemolytic streptococcus	2	5 mg. % (?) [*]	Evisceration	Temperature normal within 2 days. Complete healing of socket within 7 days
32	38	Cellulitis of lower lid and cheek following trauma	No growth obtained on culture	10	8 mg. %	Incision and drainage	Rapid disappearance of inflammation

^{*} Treated with "Prontosil solution" parenterally. No actual blood levels determined.

mide. Cultures were taken from the site of the infection in every case. Four of these cultures showed beta hemolytic streptococci, while the fifth culture showed no growth. Two of these cases were severe infections of the lid, two others were infected sockets following enucleation and evisceration, respectively, while the fifth case was in a diabetic and showed a posttraumatic cellulitis involving the lids. The five cases are summarized in chart 6.

All of these infections began to subside within 24 hours after beginning

erate activity. Both had been vigorously treated with copper-sulfate stick locally in the past, and had recurrences of activity after omission of this local treatment. A summary of these cases is given in chart 7.

These patients with trachoma both exhibited a remarkable clearing of injection, follicles, and corneal vascularization within a few days after the initiation of sulfanilamide therapy. There was no change in the old scarring of the corneae, but the second patient exhibited marked clearing of corneal opacities known to be

CHART 7
CASES OF TRACHOMA TREATED WITH SULFANILAMIDE

Case Number	Age years	Duration of the Trachoma	Days of Sulfanilamide Therapy	Average Blood Level	Results
33	27	14 years	17	6 mg. %	Conjunctival injection diminished after 2 days. Follicles progressively diminished in size after 3 days. The slight active vascularization present in one cornea gradually disappeared. No change in old scarring of corneae or conjunctivae
34	21	14 years	21	6 mg. %	Conjunctival injection disappeared within 2 days. Rapid and progressive shrinkage of follicles after 2 days. Corneal vascularization diminished markedly after 2 days, but did not entirely disappear. Marked reduction in corneal infiltration with significant improvement of vision. No change in old scars

of recent origin. These patients were observed for only a few weeks after treatment ended.

For purposes of comparison, two patients with trachoma who have been treated with intravenous tartar emetic may be cited. The first was an 11-year-old boy with a mild acute trachoma. He was given a total of 1.2 gm. of tartar emetic intravenously during a 24-day period, and on the sixth day after this course of therapy was begun a bilateral grattage was performed. The eyes began to show improvement three days after treatment was begun, and continued to improve gradually. By the end of the course of treatment the lesions were entirely healed. The second case was in a 50-year-old female with recurrent activity of a trachoma of 18 years' duration. She was given a course of tartar emetic exactly similar to that in the first case. There was considerable subjective improvement, and the thickness and red-

ness of the lids decreased noticeably. However, the vascularization of each cornea was unaffected, and the few follicles present before treatment was begun were not appreciably diminished. There appeared to be very slight clearing of a nebulous infiltration of the right cornea, but the other cornea remained unchanged. Tartar emetic undoubtedly exerted a beneficial effect, but its effects were neither so rapid nor so extensive as the results obtained in the two cases treated with sulfanilamide. This is in keeping with the observations previously cited from the literature.

INCLUSION BLENNORRHEA

Two patients with inclusion blennorrhoea have been treated with sulfanilamide. Diagnosis was based on a history of onset one to two weeks after birth, the clinical appearance, and the presence of inclusion bodies in epithelial scrapings. These two patients recovered completely

CHART 8
CASES OF INCLUSION BLENNORRHEA TREATED WITH SULFANILAMIDE

Case Number	Age Weeks	Smears and Cultures of Conjunctival Discharge	Duration of Conjunctivitis	Days of Sulfanilamide Therapy	Average Blood Level	Remarks	Results
35	4	Diphtheroids	14 days	9	10 mg. %	No local treatments	Discharge ceased within 3 days. Follicles and injection gradually disappeared within 6 days. Inclusion bodies still found on the 4th day, but not on the 7th
36	3	Negative	14 days	6	5 mg. %	Argyrol and boric irrigations locally	Discharge, follicular hyperplasia, and conjunctival congestion disappeared completely within 4 days

CHART 9

CHEMOTHERAPY IN CORNEAL ULCERS ASSOCIATED WITH CONJUNCTIVITIS

Case Number	Age Years	Duration of Uleer	Organisms in Conjunctival Sac	Days and Type of Chemotherapy	Average Blood Level	Remarks	Results
37	27	9 days	Pneumococci	Sulfapyridine by mouth for 7 days	5 mg. %	Optochin 1% locally added to treatment one day after beginning sulfapyridine	Conjunctivitis worse after 1 day. Then gradual healing, complete within 21 days
38	28	60 days	Beta hemolytic streptococci and Staphylococcus aureus	Sulfanilamide by mouth for 4 days. Sulfanilamide solution (0.8%) instilled locally every $\frac{1}{2}$ hour for 14 days	8 mg. %	Patient also had atropine reaction	Streptococci disappeared within 3 days and staphylococci within 4 days. Conjunctivitis cleared within 4 days. Ulcer became completely clean within 10 days

within six days. A summary of these cases is given in chart 8.

CORNEAL ULCERS ASSOCIATED WITH CONJUNCTIVITIS

One patient with a pneumococcal corneal ulcer was treated with sulfapyridine. The patient got a piece of straw in his eye, and during the following week the eye became progressively more painful and inflamed. At the end of that time he was found to have a moderately severe conjunctivitis and a shallow corneal ulcer, with considerable necrotic debris, in size about 3 by 4 mm. Cultures of the conjunctival sac gave a pure growth of pneumococci. The eye was treated with atropine, hot compresses,

and boric irrigations for two days. During this time the ulcer became cleaner but the conjunctivitis became worse. Sulfapyridine therapy was then instituted.

One patient with a corneal ulcer associated with marked conjunctivitis (beta hemolytic streptococci and hemolytic Staphylococcus aureus recovered from the conjunctival sac) was treated with sulfanilamide. The ulcer followed an abrasion of the cornea, and grew steadily worse for two months before chemotherapy was begun. A summary of these cases is given in chart 9.

It is unwise to draw any conclusions from the case of pneumococcal ulcer of the cornea in which sulfapyridine was used. Improvement began two days after

CHART 10

MISCELLANEOUS CASES TREATED WITH SULFANILAMIDE

Case Number	Age Years	Type of Eye Lesion	Days of Sulfanilamide Therapy	Average Blood Level	Results
39	31	Acute anterior uveitis. (Associated with subacute bacterial endocarditis due to streptococcus viridans)	7	7 mg. %	No significant effect
40	68	Bilateral uveitis. (One eye showed nonspecific generalized uveitis histologically)	22	3 mg. %	No effect. One eye subsequently enucleated
41	62	Sympathetic ophthalmia	31	3 mg. %	No effect
42	36	Optic neuritis. (Etiology undetermined. Patient had subacute gonorrheal cervicitis)	6	8 mg. %	No effect on the eye lesion
43	28	Recurrent keratoconjunctivitis. (Later proved due to ocular hypersensitivity to flour)	13	10 mg. %	No significant effect

therapy was instituted, but healing was slow and might have taken place just as readily without the use of sulfapyridine. The result obtained in the second case was dramatic, when the initial appearance of the eye is considered.

MISCELLANEOUS

Five patients with miscellaneous eye lesions were treated with sulfanilamide. A summary of these cases is given in chart 10.

These cases include an anterior uveitis associated with subacute bacterial endo-

gonococcus infections in general. It is possible that the majority or all of these cases were not due to actual gonococcal infection. An alternative explanation is that the immune reaction of the host against the gonococcus in cases of uveitis is insufficient to overcome the infection in spite of the bacteriostatic effect of the sulfanilamide. In support of this second possibility is the fact that sulfanilamide is less effective in gonococcal arthritis than in any of the more common complications of gonorrhea.¹⁰

The five patients with ocular tubercu-

CHART 11

SUMMARY OF 43 CASES OF OCULAR INFLAMMATION TREATED WITH SULFANILAMIDE

Type of Eye Lesion	Number of Cases	Average Days of Therapy	Average Blood Level	Results
"Gonococcal" uveitis	14	16	6 mg. %	No effect
Ocular tuberculosis	5	19	8 mg. %	No effect
Purulent intraocular infection	8	11	8 mg. %	No effect in 4 cases. Significant cures in 4 cases
Infection of lids or orbit (streptococci isolated in 4 of these)	5	5	7 mg. %	Rapid healing
Trachoma	2	19	6 mg. %	Significant healing
Inclusion blennorrhea	2	8	8 mg. %	Significant healing
Pneumococcal corneal ulcer*	1	7	5 mg. %	Doubtful effect
Streptococcal corneal ulcer	1	4**	8 mg. %	Significant healing
Miscellaneous	5	16	6 mg. %	No effect

* Treated with sulfapyridine.

** Also received sulfanilamide solution locally for 14 days.

carditis, a nonspecific uveitis, a sympathetic ophthalmia, an optic neuritis of undetermined etiology, and an allergic conjunctivitis. Sulfanilamide had no appreciable effect in any of them.

COMMENT

The results obtained in 43 patients with ocular inflammation treated with sulfanilamide compounds are summarized in chart 11.

The fact that no significant effect was noted in the 14 cases of "gonococcal" uveitis is rather surprising, in view of the marked effect sulfanilamide has on

losis were given sulfanilamide because of the effect of this drug on experimental tuberculosis in guinea pigs. This form of chemotherapy has not proved of value for any manifestation of human ocular tuberculosis.

The successful results obtained in three cases of postoperative purulent intraocular infection are difficult to evaluate, since the bacterial etiology in only one of these cases was determined. However, the cure in at least two of these cases was so spectacular that it seems justifiable to use sulfanilamide or sulfapyridine in all cases of this type. It is

always quite possible that the infection may be due to an organism susceptible to chemotherapy.

The result obtained in the one case of metastatic meningococcal panophthalmitis was most dramatic.

Rapid healing of almost all streptococcal infections of the lids or orbit treated with sulfanilamide is to be expected. Likewise, rapid disappearance of streptococci from the conjunctival sac, as in the one case of corneal ulcer, is in keeping with the well-known effect of sulfanilamide on these organisms.

Julianelle,⁶⁵ in speaking of the infectious agent of trachoma, concludes that it "is a virus of remarkable frailty, succumbing before physical and chemical agents tolerated by numerous other bacterial and viral agents. Biologically, it may be characterized as possessing a low infectivity, weak propagative powers, infrequent filterability, and poorly immunogenic properties." It may be that this is one infectious agent on which sulfanilamide, even in very low concentrations, exerts a destructive rather than merely an inhibitory effect.

Rapid clearing in the two cases of inclusion blennorrhea is in keeping with the result obtained by Thygeson in the case he reported.

No conclusions can be drawn from the case of pneumococcal corneal ulcer treated with sulfapyridine. However, this drug is theoretically of considerable value in the treatment of any pneumococcal infection of the eye.

The effect of the local use of sulfanilamide solution in the eye cannot at present be evaluated. Sulfanilamide solution (0.8 percent) was instilled locally in an eye every half hour for 24 hours preceding aspiration of the aqueous. The sulfanilamide concentration present in the aqueous was found to be 0.8 mg. percent.* While a concentration of 0.8 mg. percent

is not high, this determination confirms the fact that sulfanilamide is very diffusible. In one patient in whom the drug was instilled locally at frequent intervals, staphylococci disappeared from the conjunctival sac within four days. This fact suggests that more was accomplished than could be expected of sulfanilamide in the concentration attainable by internal administration. However, disappearance of the staphylococci may have been coincidental.

Sulfanilamide concentrations were determined on samples of blood and aqueous obtained simultaneously from one patient who had been taking sulfanilamide by mouth for several days. The values obtained were 7.4 mg. percent for blood and 6.9 mg. percent for aqueous. These values parallel those obtained by Rambo⁶ in rabbits.

SUMMARY

1. The present status of sulfanilamide compounds in general medicine is reviewed briefly.

2. Reports of the usage of these drugs in ocular diseases are reviewed more completely. These reports indicate that this type of chemotherapy is definitely of value in the treatment of gonococcal conjunctivitis and of trachoma, is probably of value in the treatment of inclusion blennorrhea, and may be of benefit in certain cases of panophthalmitis, cavernous-sinus thrombosis, herpes simplex, and herpes zoster. The reported successful use of "Prontosil" solution locally is largely discounted, although the local use of a solution of sulfanilamide itself (which is active *in vitro*) is considered to have potential value.

3. Forty-three cases treated with sulfanilamide compounds in the Johns

* Sulfanilamide concentration determined by E. K. Marshall.

Hopkins Hospital because of ocular inflammations are reported, with the following results:

a. No appreciable effect was noted in 14 cases of "gonococcal" uveitis, either from the standpoint of alleviating the acute attack or of preventing recurrences.

b. No apparent effect was obtained in five cases of ocular tuberculosis.

c. Four out of eight cases of purulent intraocular infection exhibited spectacular cures; one of these was a metastatic meningococcal panophthalmitis, one was a postoperative panophthalmitis with beta streptococcus in the anterior chamber, one was a postoperative panophthalmitis with *Staphylococcus aureus* in the conjunctival sac, and the fourth was a postoperative endophthalmitis of unknown etiology.

d. Significant results were obtained in

five cases of infection of the lids or orbit; four of these were known to be due to beta hemolytic streptococci.

e. Significant improvement was noted in two cases of trachoma (stage 3); improvement was more notable than in two other cases of trachoma treated with intravenous tartar emetic.

f. Two cases of inclusion blennorrhea were cured within six days.

g. A cure of doubtful significance was obtained in one case of pneumococcal conjunctivitis and corneal ulcer by the use of sulfapyridine.

h. One case of corneal ulcer associated with streptococcal and staphylococcal conjunctivitis responded significantly. (Sulfanilamide was used locally as well as internally.)

i. No appreciable effect was noted in five other miscellaneous cases.

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MALIGNANT MELANOMA OF THE CHOROID*

FURTHER STUDIES ON PROGNOSIS BY HISTOLOGIC TYPE AND FIBER CONTENT

HELENOR CAMPBELL WILDER AND G. R. CALLENDER, M.D.

In 1931 Callender¹ classified by histologic type the malignant melanomas of the eye in the American Registry of Ophthalmic Pathology at the Army Medical Museum. Four years later Callender and Wilder² further classified these tumors by their argyrophil-fiber content. In the same year Terry and Johns³ reported the Massachusetts Eye and Ear Infirmary cases from the standpoint of incidence, cell type, and prognosis. In 1937 Benedict⁴ published a paper on the clinical considerations of melanotic neoplasms of the eye and orbit from material in the Mayo Clinic, and Lane⁵ described the results of her nation-wide survey of malignant ocular neoplasms. Interesting observations resulted from these statistical reports. Unfortunately, however, material in any single collection was relatively scant and the rate of increase slight, due to infrequent occurrence of the tumor. Thus it appeared that many years would elapse before conclusive data could be assembled. In order to overcome the handicap

of insufficient material and to determine more definitely the value of prognosis by cell type and fiber content, Dr. J. S. Friedenwald suggested that an attempt be made to collect specimens of malignant melanomas of the eye from the various clinics throughout the country. The American Academy of Ophthalmology and Otolaryngology, through Dr. Harry S. Gradle, authorized this action. At the instigation of Dr. Conrad Berens an appropriation was obtained from the American Association for Research in Ophthalmology, for traveling expenses to the various institutions in which the larger collections were housed, and for preparing microscopic slides. As a result there are at the present time 1,238 cases of malignant melanoma in the Registry. Of these, 75 patients have died from causes unknown or unrelated to the primary tumor, 85 have been definitely lost, and five-year follow-ups will probably not be obtainable on approximately 200 more. We hope that the remaining 878

* From the Registry of Ophthalmic Pathology maintained at the Army Medical Museum, Washington, D.C.

By allowing the Registry the use of their material the following ophthalmologists and pathologists have increased the number of cases of malignant melanomas in the Registry from 273 in 1935 to 1,238 at the present time. We wish to thank them, as well as the regular contributors to the Registry, for their interest, coöperation, and generosity in making this work possible.

Dr. Jonas S. Friedenwald, Wilmer Institute, Johns Hopkins Hospital.

Dr. Arnold Knapp, Herman Knapp Memorial Eye Hospital.

Dr. A. B. Reese, Wheeler Clinic, Institute of Ophthalmology of the Presbyterian Hospital.

Dr. T. L. Terry, Massachusetts Eye and Ear Infirmary.

Dr. Georgiana Dvorak Theobald, Illinois Eye and Ear Infirmary.

Dr. Sanford R. Gifford and Dr. A. B. Cushman, Northwestern University Medical School.

Dr. W. F. Moncreiff and Dr. Bertha Klien, Rush Medical School.

Dr. W. L. Benedict, Mayo Clinic.

Dr. Cecil S. O'Brien, University of Iowa.

Dr. Bruce Fralick, Department of Ophthalmology, University of Michigan.

Dr. Carl V. Weller, Department of Pathology, University of Michigan.

Dr. R. Dominguez, St. Luke's Hospital, Cleveland, Ohio.

Dr. J. Arnold deVeer, Brooklyn Eye and Ear Hospital.

Dr. Bernard Samuels, New York Eye and Ear Infirmary.

Dr. Perce DeLong, Wills Hospital.

Dr. W. E. Fry, University of Pennsylvania.

Dr. Lawrence T. Post and Dr. H. D. Lamb, Oscar Johnson Institute, Washington University.

cases will prove to be satisfactory. In 1937, of the 863 eyes sent to the Army Medical Museum for microscopic examination, 58 contained malignant melanomas. If this rate of increase continues, in a few years it should bring the collection to a thousand followed cases. It is realized that five-year follow-ups are in no way final but, as stressed by Post,⁶ a prediction of freedom from metastasis even for that length of time is of indisputable importance to the patient. When a thousand cases have passed the five-year mark many of them will have been observed 10 years or longer, and an answer to some of the problems of incidence and prognosis will be assured.

The statistical studies appearing herein are based on 253 cases of malignant melanoma of the choroid and ciliary body which have been followed for five years or longer after enucleation or in which death has occurred from metastases before the expiration of that time. No cases in which enucleation was performed within the last five years are included in this series, although some have already terminated fatally, because doing so would give a high and false death rate.

Of the 129 patients living more than five years after enucleation, 35 have been followed from 10 to 24 years. Five patients died of known but unrelated causes between 5 and 10 years after enucleation, and three died of unknown causes 13, 14, and 24 years postoperatively.

One hundred and twenty-four patients, or over 49 percent, have died from metas-

tases, the postoperative duration varying from two days to fourteen years.

In Callender's¹ first tabulation and in the report of Terry and Johns² the mixed-cell tumor appeared to be the most malignant. The epithelial group is still so small that definite conclusions cannot be drawn, but, with the slight increase in cases followed over five years, the percentage of metastatic deaths has also increased, placing it ahead of the mixed-cell type in malignancy rating.

Heretofore an attempt has been made to classify necrotic tumors on the basis of cell type. It is now felt that in many cases an accurate classification is not possible where only a small portion of the tumor contains living cells. Stimulated by Samuels's^{7, 8} two papers on necrosis a new group has been introduced for cases in which over half the tumor is necrotic. An additional study was made of the 91 patients with tumors in which small areas of necrosis were seen, with the result that 45 percent were found to have died and over 27 percent to be living.

The other groups, both cell and fiber, remain as described in the original papers.^{1, 2} A brief résumé of the basis for classification is given here for the reader's convenience.

Spindle A (fig. 1). The nucleus has a delicate, reticular structure with an ill-defined or indistinguishable nucleolus.

Spindle B (fig. 2). The nucleus contains a rather coarse network and a prominent nucleolus.

Fascicular (fig. 3). The term describes

PLATE 2 (WILDER AND CALLENDER).

- FIG. 1. SPINDLE-CELL, SUBTYPE A. HEMATOXYLIN AND EOSIN. X700.
 FIG. 2. SPINDLE-CELL, SUBTYPE B. HEMATOXYLIN AND EOSIN. X700.
 FIG. 3. FASCICULAR TYPE. HEMATOXYLIN AND EOSIN. X230.
 FIG. 4. EPITHELIOID-CELL TYPE. HEMATOXYLIN AND EOSIN. X700.
 FIG. 5. MIXED-CELL TYPE: SPINDLE-CELL SUBTYPE B AND EPITHELIOID. HEMATOXYLIN AND EOSIN. X700.
 FIG. 6. FIBER GROUP 3. WILDER RETICULUM STAIN. X700.
 FIG. 7. FIBER GROUP 2C. WILDER RETICULUM STAIN. X700.
 FIG. 8. FIBER GROUP 2B. WILDER RETICULUM STAIN. X700.
 FIG. 9. FIBER GROUP 2A. WILDER RETICULUM STAIN. X700.
 FIG. 10. FIBER GROUP 1. WILDER RETICULUM STAIN. X700.

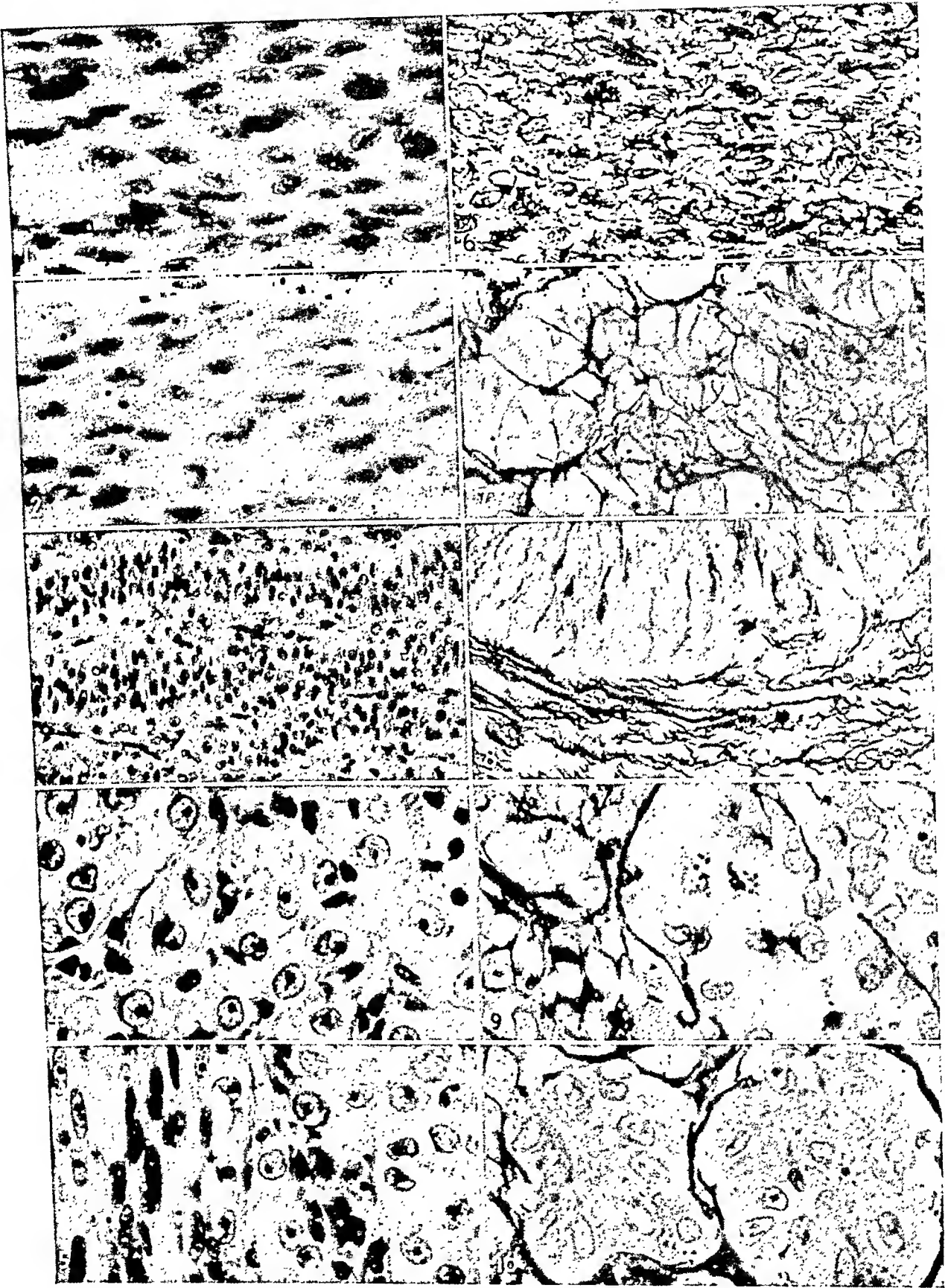


PLATE 2 (WILDER AND CALLENDER)

the arrangement of the cells in strips rather than their morphology. The cells resemble the spindle-B type.

Epithelioid (fig. 4). Round or polygonal cells, usually rather large but with considerable variation in size and shape. The nucleus is large, round, or somewhat oval, the nucleolus distinct.

Mixed (fig. 5). A combination of two or more cell types, with the exception of spindle-A and -B tumors which are included in the spindle-B series. The most usual combination in the mixed group is spindle B and epithelioid.

The fiber classification is based on the relative content of argyrophil fibers, as demonstrated by the Wilder reticulum stain.⁹ It has been our experience, as well as that of King,¹⁰ that sections of heavily pigmented melanomas should be rather thoroughly bleached in potassium permanganate and hydrobromic acid before impregnating with silver.

Group 1 (fig. 10). Tumors having no fibers, or fibers only in the interlobular stroma.

Group 2 (figs. 7, 8, 9). Those having areas with and without fibers; that is, a combination of groups 1 and 3. This group is subdivided into (a) tumors having a definite preponderance of fiberless areas, (b) tumors having areas with and without fibers approximately equal, (c) tumors having a definite preponderance of areas containing fibers.

Group 3 (fig. 6). Tumors having, in all areas, fibers forming a network about individual tumor cells.

Both classifications are based on the examination of single slides or of a very few slides from each case taken as nearly as possible through the center of the tumor and to include the uveal attachment. There is room for criticism here, and we do not imply that the criteria are necessarily uniform throughout the individual tumors but serial sectioning is impractical

as a routine procedure and impossible on previously sectioned material.

SUMMARY

There are 1,238 malignant melanomas of the eye in the American Registry of Ophthalmic Pathology at the Army Medical Museum which, with few exceptions, have been classified according to their cell type and fiber content. It is hoped eventually to have a thousand such cases that have been observed for at least five years postoperatively.

Forming the basis of this report are 253 patients with malignant melanomas that have arisen in the choroid or ciliary body, who have been followed at least five years after enucleation or who have died from metastases under five years. The total death rate for this group is less than 50 percent.

The prognostic value of classification both by cell type and fiber content is indicated by the consistent results demonstrated in tables 1 and 2 as well as in all our former tabulations. In the classification by histologic type the epithelioid cell appears to be the most malignant, the spindle-cell subtype A relatively benign. As would be expected, the mixed group, which in almost all cases contains epithelioid cells, is second in malignancy to the purely epithelioid tumor.

In the classification by fiber content, malignancy of the tumor appears to be inversely proportional to the degree of intercellular invasion by argyrophil fibers.

To present an example of the importance and practical application of utilizing both methods of classification: A mixed-cell tumor does not often metastasize if it is heavily fibered, but a moderately fibered mixed-cell tumor is far more apt to metastasize than is a spindle B having approximately the same fiber content.

The outstanding facts brought forth

TABLE 1
CLASSIFICATION BY HISTOLOGIC TYPE AND FIBER CONTENT OF 253 MALIGNANT MENANOMAS OF THE CHOROID AND CILIARY BODY FOLLOWED FIVE YEARS OR MORE.

Fiber Content	1 No Fibers Among Tumor Cells		2A Less than 50% Fibers		2B About 50% Fibers		2C More than 50% Fibers		3 Fibers Throughout All Areas		Total Cases	Percent Dead	Average Post- Operative Duration of Dead Cases, Years
	Total Cases	Percent Dead	Total Cases	Percent Dead	Total Cases	Percent Dead	Total Cases	Percent Dead	Total Cases	Percent Dead			
Spindle A	2	100	3	25	6	11	6	22	3	6	18	21	2-4/12
Spindle B	1	100	27	50	18		9		5		61	50	1
Fascicular			2	100	1	66					4	80	4-10/12
Epithelioid	5	100	2	70	3	67	22	40	1		5	65	2-10/12
Mixed			67		40						135		
Too necrotic to classify	3	100	11	81	11	36	4	25	1		30	56	4
Total	11	100	112	58	79	44	41	29	10		253	49	2-11/12

TABLE 2
CLASSIFICATION BY FIBER CONTENT AND HISTOLOGIC TYPE OF 253 MALIGNANT MELANOMAS OF THE CHOROID AND CILIARY BODY FOLLOWED FIVE YEARS OR MORE.

Cell Type	Spindle A		Spindle B		Fascicular		Epithelioid		Mixed		Necrotic		Total Cases	Per cent Dead	Average Post- Operative Duration of Dead Cases Years
	Total Cases	Per- cent Dead	Total Cases	Per- cent Dead	Total Cases	Per- cent Dead	Total Cases	Per- cent Dead	Total Cases	Per- cent Dead	Total Cases	Per- cent Dead			
1. No fibers among tumor cells					1	100			5	100	3	100	11	100	2-3/12
2A. Less than 50% fibers	3		2	100	2	50	2	100	67	70	11	81	112	58	3-2/12
2B. About 50% fibers	6		18	11	1		3	66	40	67	11	36	79	44	2-11/12
2C. More than 50% fibers	6		9	22					22	40	4	25	41	29	3-5/12
3. Fibers throughout all areas	3		5						1		1		10		
Total	18		61	21	4	50	5	80	135	65	30	56	253	49	2-11/12

In many instances the percentage of deaths is a fraction higher than appears in these tables. The plus sign, as well as the fraction, has been omitted for simplification.

by this study are that no deaths have occurred from any spindle-cell subtype A or fiber group-3 tumor and that the patient in all cases in which no argyrophil fibers appear among the tumor cells has died.

It is concluded that the two classifications, used in conjunction with each other, definitely narrow the field of error

in the prognosis of uveal melanoma.

The writers are particularly indebted to Lt. Col. James E. Ash, Curator, Army Medical Museum, for his encouragement and assistance in the collection of the material and the preparation of this report. We also wish to thank Captain Elbert Decoursey and the members of the Museum staff for their valuable coöperation.

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LECTURES ON MOTOR ANOMALIES*

XII. OCULAR SPASMS

A. BIELSCHOWSKY, M.D.

Hanover, New Hampshire

Ocular spasms, frequently met in functional neuroses and hysteria, require consideration not only because of their importance in the making of a differential diagnosis, but also in order to clear up the many misunderstandings and contradictions found in the discussion of alleged paralyses of hysterical or neurotic origin. Whether or not such paralyses occur has been a moot point to this day. Uthoff,¹ like so many ophthalmologists and neurologists, while refusing to accept hysteria as a cause of the paralysis has, strange to say, referred to "publications which affirm beyond doubt the exceptional occurrence of hysterical paralyses of even individual muscles of the eyes." I think that one is not only entitled but is obliged to doubt the reliability of the observations reported as instances of purely hysterical paralysis. The investigations made in many cases were not exact and exhaustive, or the results were not interpreted correctly, or the length of time available for the observation was not sufficient, so that a disease organic in nature but complicated by hysterical symptoms, could not be excluded as a possible cause of the paralysis. The dictum of Mauthner, that the frequency of hysterical disturbances of ocular muscles is directly proportional to the ability to produce at will the condition concerned,

is still valid today. Accordingly, certain spastic disorders of ocular muscles are met most frequently in cases of hysteria, since the corresponding innervation is governed by the will and the spastic movements can be learned by exercise and initiated by suggestion. Sometimes blepharospasm is the only hysterical stigma, and it is often caused by trauma or disease of the eyes or of their adnexa. Convergence spasm also frequently occurs in hysteria, sometimes as its only symptom, but generally associated with spasm of accommodation and contraction of the pupils. The inconstancy of the angle of squint and the prompt success of suggestive treatment prove the functional nature of the convergence spasm, notwithstanding the fact that the cause could be an anomaly of organic origin.

During the World War I examined a soldier who, nine months before, had been wounded near the interior angle of the eye by a piece of splintered shell. He complained of diplopia, poor vision, headache, and vertigo. I found that he had spastic ptosis, spasm of convergence and accommodation, intense miosis, and continuous tremor of the head. The poor vision, due to spasm of accommodation, could be improved by concave glasses; but when one eye was covered the vision became normal immediately without any glass. An examination of the muscles of the eyes revealed the presence of paralysis of both depressor muscles of the left eye due to the trauma. When asked more closely about the diplopia, the patient told me at first that he had been greatly annoyed by the diplopia, the images being

* From The Dartmouth Eye Institute, Dartmouth Medical School. Read before the Seventh Annual Mid-Winter Course of the Research Study Club, Los Angeles, California, January, 1938.

¹Uthoff, W., in Graefe and Saemisch's *Handbuch der gesamten Augenheilkunde*, Leipzig, Wilhelm Engelmann, 1915, vol. 11, pt. 2B.

at different levels. Endeavoring to overcome the trouble he found some relief when he made a strong convergence effort, by which one of the images was shifted to the periphery of the visual field so that it was less noticeable, while simultaneously both images became indistinct.

The case is interesting because it shows the development of the characteristic ocular symptoms of a functional neurosis, based on paralysis of organic origin. The symptoms of paralysis were masked by the strong convergence spasm so that they could be revealed only by an exceptionally careful examination. Until this was done, every kind of treatment, of course, had been fruitless. The disappearance of the spasm could be effected only temporarily by putting an opaque glass before one eye, which eliminated the troublesome diplopia. The patient was cured definitely as soon as binocular single vision was restored by advancement of the paralyzed inferior rectus muscle.

Conjugate deviation of the eyes has been observed in some cases of hysteria. It is always easy to prove that this is not caused by an associated paralysis.

Bilateral nystagmus of hysterical origin is rare and is never the only symptom of hysteria; it is almost always connected with spasm of the orbicularis and convergence muscles. The nystagmic movements are exceedingly fine and rapid, much more rapid than in any other kind of nystagmus.

Hysterical associated paralyses of the movements of the eyes have been described repeatedly, especially during and after the War; they were caused by hardships and emotional excitement or by severe nervous shock. At first the symptoms may be similar to those in cases of so-called pseudo-ophthalmoplegia: inability to move the eyes at word of com-

mand and, in some cases, to follow the moved object of fixation; on the other hand, the fixation was maintained when the patient's head was rotated passively not only by a sudden jerk but also quite slowly. At times, however, spontaneous movements of the eyes could be observed when the patient was left to himself, or was talking with other patients, or reading a paper. The true functional nature of the paralysis could be proved only by the success of suggestive treatment.

That the manifestations of convergence or divergence paralysis are sometimes based on a functional neurosis, and how this can be proved, have already been discussed.

Cases of hysterical divergence spasm combined with other hysterical symptoms have been described by Kehrer and other authors. It seems to me more likely that in some of these cases divergence spasms have been simulated by an exophoria that became manifest intermittently, especially during attacks of blepharospasm in which the eyes have a tendency to diverge on account of their elevated position. True divergence spasm, I am sure, occurs only quite exceptionally, manifesting itself in a divergence of such instability as one never encounters in simple exophorias.

I have never seen either paralysis of individual ocular muscles or unilateral ophthalmoplegia of a true functional, that is, nonorganic, nature, and in the publications on this subject I have not found a description of any case that convinced me that the supposition of a functional origin of the paralysis was correct. Either the proof of the paralytic character of the related symptoms was equivocal, so that they could just as well have been due to nonparetic anomalies, or the patient was not kept under observation long enough to exclude the organic nervous disease, which, of course, may be complicated by

hysterical symptoms. Only unilateral, nonspastic (flaccid), hysterical ptosis occurs definitely. This is not strange, inasmuch as even a normal person can train himself to relax completely one of the elevators of the upper lids. Unilateral (pseudo-) ptosis is described much more frequently as a hysterical sign, but it must be emphasized that in such cases an organic lesion as the starting point cannot always be excluded.

Several years ago I was asked to give an opinion on a patient suffering from various troubles that he attributed to contusion of the head sustained in an automobile accident. His physician, not being able to find any evidence of an organic lesion, had made a diagnosis of traumatic neurosis. At last, after the case had been submitted to arbitration, I was asked about the nature of the blepharospasm in the right eye. After I had, with much trouble, induced the patient to open his right eye, I could find nothing abnormal in the eye itself, but upon investigating the motor apparatus I discovered a slight paresis of the superior rectus muscle of each eye. The patient had never complained of diplopia and, when asked, did not remember ever having had it. But I was forced to admit that the blepharospasm was probably caused by the accident, perhaps by a hemorrhage within the nuclear region, and that the patient, although not conscious of seeing double, felt constrained by the blurred vision, to keep one eye closed.

In recent publications, especially in Germany, another kind of hysterical disturbance has been discussed; namely, the so-called dissociation of movements of the eyes. It was first described by Kunn, as follows: The eyes are not held rigidly in a certain position as in real spasms, nor do they obey the patient's will, but move about rather irregularly, one eye in-

dependently of the other, as in a comatose condition. The supposition that the association of movements of the eyes can be suspended temporarily merely as a symptom of hysteria is a strong contradiction of all physiologic and clinical facts by which the general validity of Hering's so-called law of the association of eye movements is proved. Dissociated movements of the eyes occur in a comatose state, in narcoses, and during sleep; that is to say, in conditions in which the muscles of the eyes are governed neither by the will nor by the compulsion to fusion but may receive stimuli of sub-cortical origin. However, it is beyond one's volitional power to innervate either an individual eye muscle or the muscles of one eye alone, and the contrary assertion depends on a misunderstanding of Hering's law. The occurrence of unilateral or asymmetrical movements of the eyes by no means proves, as I emphasized in my first lecture, that these movements arise from asymmetrical innervations of the two eyes. If two innervations, one driving both eyes in the same direction, for instance to the right, and another driving them into convergence, arrive at the same time, the result must be an asymmetrical or unilateral movement in spite of the fact that both eyes are influenced equally by the same impulses. The symptoms adduced as proof of dissociation cannot, on critical examination, be accepted as such. They could be due to heterophoria becoming manifest intermittently, according as the patient is attentive and interested in the test object or tired and listless, or to organic disease complicated with hysteria. Both could not be excluded in any given case. Since some of these patients were unable to fixate an object in spite of normal mobility and sufficient visual acuity, I am inclined to assume that there was a lack of voluntary impulses because of an in-

hibited cortical function, as is the case in the hypnotic state.

What is most characteristic of hysterical disturbances of ocular movements is their inconstancy and amenability to treatment by suggestion. In any case of hysteria complicated by apparently unusual motor anomalies of the eyes one must take into consideration the various possibilities of their origin, as just discussed, particularly the coincidence of simple heterophorias with hysterical spasms or organic lesions.

If spasm is to be understood as the effect of an excessive innervation, the occurrence of spasms of an individual muscle or of a muscle group in one eye is extremely rare. Many cases described in the literature that have been interpreted as spasms did not show unequivocal signs and symptoms of spastic origin. I have never seen spasms of individual muscles, either in hysteria or in convulsive attacks, in which spasms of convergence as well as of associated parallel movements are frequently encountered. Some authors take the secondary deviation of the sound eye in cases of paresis of the other eye as a spastic phenomenon. I look at it in a different light. In most of these cases secondary deviation is not due to a spasm but simply to the effect of the increased innervation necessary for the action of the paretic muscle. According to the fundamental law of ocular movements, the sound eye receives the same innervation and responds to it in the normal way, whereas the reaction of the paretic eye is abnormally weak. Nor can the contracture of the antagonists of a paretic muscle, if it is based on a structural change of the antagonists, be interpreted as a spasm. That would be admissible only in those cases in which an unusually high deviation is to be attributed to an increased tonus, not to a structural change of the

antagonists of the paretic muscle. Overaction of the inferior oblique, be it a primary or secondary anomaly, as it was described in one of the previous lectures is, from my point of view, no spastic phenomenon, because it originates either from a structural change of the muscle in long-lasting pareses of the trochlear nerve, or from congenital or acquired deficiencies of the check ligament of the inferior oblique muscle.

The most frequent spasms of conjugate movements are found in cases of recent cerebral lesions. Conjugate deviation, as it was discussed in a previous lecture, as a rule, is caused by several factors. One of these is the paralysis of an associated group of muscles while the antagonistic group not only ceases to receive its inhibitory innervation but, in addition, may be stimulated if the lesion extends to the other hemisphere. It is due mainly to the spastic factor that conjugate deviations of considerable magnitude sometimes disappear within a few hours, as soon as the patient regains consciousness. Spasms of conjugate vertical, mostly upward, movement are almost pathognomonic signs of postencephalitic Parkinsonism; the attacks occur at irregular intervals, favored by bright light and psychic excitations. They last from a few minutes to several hours and, as a rule, are combined with spasms of convergence. During the attacks, the patients are unable to turn the eyes downward for more than a second.

In the discussion of alternating hyperphoria, I asserted that there were signs and symptoms that pointed to abnormal excitations of the vertical divergence innervations producing either unilateral or alternating vertical divergence movements. In those cases, as well as in the very rare cases of divergence excess and in convergence spasm, the instability of the position of the eyes relative to each

other is the main characteristic of their spastic origin in contrast to the abnormal positions of the eyes, the relative stability of which points to an anatomico-mechanical basis.

Nystagmus represents a particular kind of spasm in which, as a rule, two antagonistic muscle groups are involved. In the majority of cases the movements are parallel and take place in the horizontal direction. Unilateral vertical nystagmus occurs in rare cases of unilateral amblyopia. All kinds of associated as well as dissociated ocular movements are to be met with in miners' nystagmus. The eyes, in addition to vertical, horizontal, and rotary movements, perform peculiar oblique and circumductional movements; they are stopped by alcohol and light and aggravated by physical effort and darkness. In the etiology of miners' nystagmus, insufficient illumination in pits, where safety lamps are used, is the chief factor. Typical pendulumlike nystagmus arises in earliest childhood in cases with either congenital or acquired bilateral amblyopia, albinism, color-blindness, and strabismus. Hereditary tendency is not infrequently demonstrable and may account for the voluntary nystagmus that some people can produce. Labyrinthine or vestibular nystagmus is always a jerky, never a pendulumlike nystagmus. It is produced either by disease of the labyrinth or artificially by Barany's tests,

or by lesions of the vestibular nerves or nuclei as, for instance, in cerebellar abscesses, tumors of the brain, particularly those in the cerebellar and pontine region. In jerky nystagmus the eyes make a slow swing in one direction followed by a quick return. It is a rather frequent sign of multiple sclerosis and epidemic encephalitis, combined with and perhaps owing to associated ocular pareses. If a strong innervation has, for a moment, turned the eyes toward the paretic side, they cannot stay there for any length of time but move slowly back to their primary position, and the impulse has to be renewed if the tendency to look to the paretic side continues.

In the foregoing lectures on motor anomalies only a few suggestions could be given as to the importance of the physiologic fundamentals for the analysis of clinical phenomena as the starting point for a rational therapy. In view of the immense diversity presented by the motor anomalies of the eyes, I always warn emphatically against following any schematic formulas in examining and treating motor anomalies. One must be and will be independent of them if one has become familiarized with the physiology of the ocular muscles and with the sense of space. All the principles of the methods of investigation as well as of the diagnosis and treatment must be derived from the physiological laws.

INTERMITTENT OCCLUSION OF THE CENTRAL RETINAL ARTERY*

T. E. SANDERS, M.D.

Saint Louis

Although temporary impairment of vision as from acute glaucoma, ciliary spasm, and migraine is not uncommon, complete temporary blindness is very unusual. Even before the advent of the ophthalmoscope it was attributed to transient retinal ischemia, but as the knowledge of retinal vascular disease increased, the condition was recognized as usually being due to intermittent occlusion of the central retinal artery, the majority of the cases being described as spasm of the central retinal artery.

Since the fundus is normal between attacks, which are of short duration and irregular occurrence, it is unfortunate that the physician does not usually have the opportunity to examine the patient ophthalmoscopically during an attack, the diagnosis being assumed from the subjective symptoms alone.^{1, 2, 3} Several authors^{1, 4, 5} have reported such cases ending in permanent occlusion of the central artery with fundus findings of embolism of the central artery. Troncoso⁶ states that in cases of embolism due to obliterative endarteritis, there are usually prodromal attacks of blindness or blurred vision before the final loss of sight occurs.

Langdon⁴ in 1914 was able to find eight cases in the literature in which the fundus was observed during an attack and the occluded vessel seen. Crisp⁷ in 1921 found five additional cases in the literature, but his case cannot be included as there was only a single attack with a permanent field defect. There have been a

number of similar cases reported since that time.^{8 to 13}

The classic example most often quoted in the literature is the case of Harbridge.¹⁴ The patient, a man aged 49 years, had no unusual ocular findings when first examined. He stated that the previous day he had noted numerous attacks of blindness in his left eye varying from one to five minutes, recurring about very two hours, but on the present day they had been noted about every 40 minutes. The sight invariably left from the nasal side of the field as if a veil were being drawn before it until all vision was lost. The first attack came on while the patient was bending over, and all subsequent attacks practically followed any movement requiring a bending position. While he was being examined an attack took place. "The inferior temporal artery gradually became lessened in caliber until completely collapsed, followed rapidly by the inferior nasal and the superior arteries undergoing the same change; following quickly upon the arterial change, the veins underwent a similar process until the entire retinal circulation looked very much like ribbons against the fundus. The head of the nerve became pallid; the retina became somewhat hazy. After the fundus remained in this condition four minutes, gradually the inferior artery began to fill quickly, followed by the others, immediately the veins began to fill, the inferior becoming enormously distended. Sight did not return synchronously with the filling of the vessel, but followed immediately after." The attacks continued with more or less frequency for 10 days, ceasing after a thorough purging.

* From the Department of Ophthalmology, Oscar Johnson Institute, Washington University Medical School. Read before the Saint Louis Ophthalmic Society, January 27, 1939.

Another typical case is that of Bruner.⁸ A man, aged 34 years, had first noted sudden loss of vision in the left eye lasting several minutes on the day when first seen. He had several similar attacks during the day. Ophthalmoscopic examination was not unusual. "During the attacks the vision, in a few seconds diminished to hand movements only, and the fundus of the left eye showed the following striking picture: The nerve and retina decidedly paler than in the right eye; the arteries are all markedly contracted, appearing as mere threads; the veins show entire cessation of blood flow, the venous pulse ceasing entirely; the blood in the veins assumes a granular appearance due to the breaking up of the normal blood column; in from one to three minutes the flow of blood in the vein recommences, at first slowly, then more rapidly, the venous pulse reappears, the arteries assume their normal caliber and appearance and vision rapidly returns to normal." In three days the attacks had increased in number to 10 a day, but at the end of a week disappeared permanently, the treatment being sodium bromide, nitroglycerin, cathartics, meat-free diet, and no tobacco.

A very similar case to the two above is being reported here not only because of its rarity, but because the attacks could be induced almost at will, thereby greatly assisting in the study of the condition; and because this case seems unique in that fundus photographs were obtained during an attack.

CASE REPORT

H. R., aged 60 years, a German-American laborer, was admitted to the Washington University Eye Clinic on March 9, 1938, complaining of intermittent loss of vision in his left eye.

He had been refracted in the clinic on March 20, 1935, having worn bifocal glasses since the age of 42. At that time

his ocular examination was not unusual except for hyperopia as follows: with O.D. +3.25 D. sph., V. = 6/6; and O.S. +2.50 D. sph., V. = 6/6; with add +2.50 D. sph., O.U. he read 15 type.

He had no other ocular complaints until about March 1, 1938, when he noted a sudden loss of light perception in his left eye. For the previous two weeks he had been employed digging a cellar under a house, a job which necessitated marked exertion while bending almost double. The first attack came on while he was doing this work, but vision became normal within a few seconds after he had stood erect and rested. He had three similar episodes of loss of vision the same day, all of which were associated with straining in a cramped position and were promptly relieved by rest and standing erect. During the next few days he continued to have these attacks while working. He also had a few following less strenuous exertion as walking, leaning over, and turning the head suddenly.

The loss of vision is sudden, with no warning, and is complete—no perception of light remaining. The loss is usually only for short periods, varying from a few seconds to several minutes, a few having persisted for as long as 10 minutes. The return of vision is "as if a dense black smoke were rolling away from in front of the sun"; it is gradual, usually starting in the inferior field and progressing to the superior field as if a curtain were rising; it also at times returns from the center toward the periphery as if a pinhole were slowly and evenly expanding.

The patient has no other ocular complaints, there being no ocular discomfort, headaches, nor poor vision. Between attacks the left eye is perfectly well; in fact, the acuity of the left eye is slightly better than that of the right.

Ocular examination. Vision in the right

eye was 6/60, with correction 6/10+; in the left eye 6/60, with correction 6/7.5.

The lids, conjunctivae, and lacrimal apparatus were not unusual. The corneae, irides, and anterior chambers were normal.

The pupils were round, equal, and regular. They reacted actively to light and during accommodation.

The extraocular muscles were intact, but convergence seemed weak. There was no movement under cover.

Tension (Schiötz) was 17 mm. Hg in each eye.

The visual fields, both peripheral and central, were normal.

Ophthalmoscopic examination. Media were clear. The discs were of good color and outline. The arteries were essentially normal in appearance, but there may be an early minimal sclerosis as shown by a slight increase in light reflex and some very small changes in vessel caliber. No exudates nor hemorrhages were noted. The maculae were normal.

At the first visit there was no evidence of ocular disease, but on return three days later, an attempt to reproduce the loss of vision was successful. The conditions of the patient's work were duplicated by marked exertion as he was bending over. After several minutes of effort, he stated that his left eye was completely blind.

Immediate ophthalmoscopic examination revealed that all the retinal arteries were reduced to thin white threads that could be seen only with difficulty. The veins seemed normal. The disc was pale and the retina hazy, but no red spot was seen at the macula. The phenomenon disappeared in a few seconds before it could be studied in detail. However, during the next few days similar exercise induced the condition many times, lasting from a few seconds to several minutes. About a third of the attempts were unsuccessful. The appearance of the fundus

was usually the same with complete obliteration of the central retinal artery and its branches. The inferior temporal vessel seemed to be the least affected. The actual closure was at no time observed, as the patient was always exercising at this time, but it was noted that the vessels filled several seconds before vision returned. It was also observed that there was usually a dilation and distention of the retinal veins for 10 or fifteen minutes after disappearance of the retinal occlusion. Although the condition could be reproduced fairly regularly, it was often so transient that it was fortunate that satisfactory fundus photographs were obtained.

After examination in the medical clinic, the patient on March 21, 1938, was admitted to the Medical Service in Barnes Hospital for detailed study and observation.

Except for the intermittent loss of vision already described, the patient stated that he was in excellent health with no complaints. He had always been well and strong and had been very active physically all of his life, gymnastics being his hobby.

At the age of 19 years he had an inflammation of the left side of the face, probably from a gumboil, with swelling so great that the eye was swollen shut. This was lanced and pus drained, healing with the present scar. When 20 years old he was in the hospital for three weeks with inflammatory rheumatism, both knees being swollen, red, and painful. At the age of 39 he was again in the hospital with another attack of rheumatism which started in the left foot, spreading to arms, legs, shoulders, and hands. He recovered fully with no recurrence or complications. When he was 31, he had typhoid fever for four weeks, which left him with an alopecia, for which he has worn a toupee for 15 years. Two years previously he fell 20 feet from a roof, injuring the left

side of his face and causing a very severe black eye. He denied any venereal infection. The family history was not unusual.

Physical examination disclosed the patient to be well developed, of stocky build, and with ruddy hands and face.

The head was symmetrical; the ear canals and membranes were normal. The mouth had several edentulous areas; the left upper canine was loose, and there were some dental caries. Considerable infection was seen along gingival margins. There was marked hypertrophy of the left tonsillar tissue. The jugular glands were palpable bilaterally.

Neck: The thyroid was not enlarged. There was no adenopathy.

Chest: Expansion was full and equal. The lungs cleared to auscultation and percussion. There was some emphysema.

Heart: Rhythm was regular, 80 to 84 per minute; slightly enlarged; sounds were not unusual; no murmurs. Blood pressure was 140/90.

Abdomen: No rigidity, tenderness, nor masses were found.

Rectal: No unusual conditions were observed.

Extremities: The radial arteries were palpable, the feet slightly suffused and cyanotic. Dorsalis pedis and posterior tibial present but not strong. A very large varicosity was observed over the medial aspect of the left leg with some induration over it.

Neurological: Not unusual.

Laboratory examination.

Urine: Specific gravity was 1.017; no sugar nor albumen, no red blood cells, white blood cells, nor casts. P. S. P. (intravenous) 70 percent in 40 minutes; concentration 1.018, dilution 1.004.

Blood: Kahn test was negative; red blood cells, 5,788,000 on an average of four counts; hemoglobin, 99 percent (Newcomer); white blood cells, 7,700; the Schilling count, normal.

Blood chemistry: Sugar, 92 mg. percent; urea N, 16 mg. percent; calcium, 9.8 mg. percent; phosphorus, 3.5 mg. percent.

Spinal fluid: 4 cells per cu. mm.; Pandy test, negative; total protein, 49 mg. percent; colloidal gold, 000 121 0000; Wassermann test, negative; Cholesterol, 330 mg. percent.

Basal metabolic rate was -9 percent and +4 percent.

Electrocardiogram showed some right ventricular extra systoles but no evidence of myocardial damage.

Roentgenological examination disclosed a normal skull; chest and lungs clear; some scoliosis of the dorsal spine. Fluoroscopy showed widening of the aortic shadow due to sclerosis.

Ocular examination. History and examination were as already noted.

Manifest refraction: Vision was O.D. 6/30, with +3.25 D. sph. \approx +.50 D. cyl. ax 180° = 6/5; O.S. 6/20+, with +2.25 D. sph. \approx +.75 D. cyl. ax. 20° = 6/5; with add +2.50 D. sph., O.U. he read 15 print at 32 cm.

Muscle balance (Maddox rod):

20 feet: 3^ΔRt. Hyperphoria 12^ΔExophoria
14 inches: 2^ΔRt. Hyperphoria 32^Δ

Exophoria

Prism divergence 12^Δ, prism convergence 20^Δ; convergence near point, 18 cm.

Tension taken shortly after an attack was O.D. 17 mm. Hg; O.S. 15 mm. Hg (Schiötz).

Fields taken within one-half hour after an attack were full peripherally to 3/330 white. Central fields to 2/1,000 white and 5/1,000 red and blue were normal.

While in the hospital subjective loss of vision was noted following forced hyperventilation during physical examination and twice spontaneously while lying quietly in bed. Digital compression of the globe produced subjective loss of

vision without any noticeable fundus change. Pressure on the carotid sinus produced no subjective nor objective change.

Dr. W. B. Kountz of the Vascular Division found that the subjective change was brought on by exercise and intravenous injections of epinephrine, the latter being not so clear-cut as the exercise. Dilators of the vascular system appeared to prevent the phenomenon, which seemed to appear with elevation of blood pressure to 180/100—180/110.

With the aid of Drs. Dan Myers and Paul Hageman of the Medical Department the following tests were performed:

(1) Compression of neck with blood-pressure cuff while spinal puncture needle was in place: original pressure, 260 mm. water; cuff to 20 mm. Hg, 325 mm. water; cuff to 40 mm. Hg, 450 mm. water; release, 250 mm. water. There was no loss of vision nor fundus change, and no elevation of the blood pressure.

(2) When tilted at 45 degrees with head down for 20 minutes, there was no effect on the blood pressure.

(3) When both feet and right hand were in ice water for 15 minutes, the blood pressure rose 20 mm. Hg to 150 systolic.

(4) Valsalva experiment: Upon forced expiration while holding breath, the blood pressure dropped from 130/92 to 112/96.

(5) Hyperventilation from inhalation of 30 percent CO_2 brought about no change in the blood pressure.

(6) Inhalation of amyl nitrite caused a drop in blood pressure to 110/55.

None of these tests produced the complete occlusion that had been noted after exercise. However, after several of the tests, particularly the Valsalva, and, to a lesser extent, after tilting and ice water, some slight loss of vision was noted with a questionable attenuation of the arteries of the left fundus. No change was noted after CO_2 or amyl-nitrate administration. A short time after these tests, a complete

occlusion was precipitated by exercise, which seemed to be the only means by which an attack could be induced.

On two occasions, after the patient had taken nitroglycerin, gr. 1/1000, under the tongue, an attack could not be precipitated even after violent exercise.

The patient was discharged from the hospital March 30, 1938, with the following diagnoses: 1. Intermittent occlusion of the central retinal artery, left. 2. Moderate hypermetropia with a slight amount of astigmatism, correction giving normal vision. 3. Exophoria, marked, from convergence insufficiency plus divergence excess. 4. Arteriosclerosis generalized, moderate. Retinal, minimal. 5. Emphysema, postural, the increase in red blood count probably being secondary to this. 6. Chronic tonsillitis. 7. Dental caries. 8. Varicose veins, left leg.

He was referred to the clinic and given the following advice and prescription: 1. No heavy exercise at present. 2. Abstinence from tobacco and alcohol. 3. Erythrol tetranitrate, gm. 0.15, three times a day. 4. To carry an amyl-nitrite perle continually and inhale the contents if loss of vision lasts longer than a few minutes. 5. If the loss of vision continues, to come to the hospital immediately for a paracentesis of anterior chamber and an injection of acetylcholine.

When he was seen one week later he stated that he had been taking the erythrol tetranitrate regularly and had had no attacks, but that he had been doing no heavy work. At this time the occlusion could not be induced by exercise.

He was next seen seven weeks later and had ceased taking the drug about four weeks before. He had been free of attacks, although he had been working regularly. An attack could not be elicited.

He was last seen on January 25, 1939, 11 months after the onset. He had been working hard every day without any sug-

gestion of an attack of loss of vision. His general health was good except for occasional dizziness. Vision was O.D. 6/6; O.S. 6/5— with correction.

Ophthalmoscopic examination showed definite increase in the sclerosis of the retinal arteries. Attenuation with increase in light reflex and definite arterio-venous compression were present.

An attempt to precipitate an attack of blindness was unsuccessful, there being no change in the appearance of the arteries. The general physical examination showed no change. The blood pressure was 118/85.

Except for abdominal pain, the patient continued to be in good health with no return of ocular symptoms for sixteen months. He died July 4, 1939, in St. Louis City Hospital following a cholecystectomy.

COMMENT

Similar cases usually have been reported in the literature as spasm of the central artery, the role of spasm being assumed rather than proved. Some authors consider permanent occlusions to be on

a spastic basis, and the term is also used in hypertensive retinal disease. As the fundus picture in this case seems identical with that of permanent occlusion or embolism of the central artery, the term intermittent occlusion of the central artery seems not only more accurate but less confusing than spasm of the central artery. The present case seems quite typical, being very similar to the quoted cases from the literature.

An attempt to photograph an attack was successful, an excellent series being obtained that gives a very satisfactory idea of the appearance of the fundus before, during, and immediately after an occlusion. Figure 1 is a photograph of the left fundus, showing it to be essentially normal. The arterial changes are so slight as to be unrecognizable in the photograph and barely noted with the ophthalmoscope.

Figure 2 was taken a few minutes after figure 1, during an attack that was precipitated by exercise while the patient was bending over. The most striking change is in the appearance of the arteries, which are reduced to mere threads. The inferior temporal is the least affected

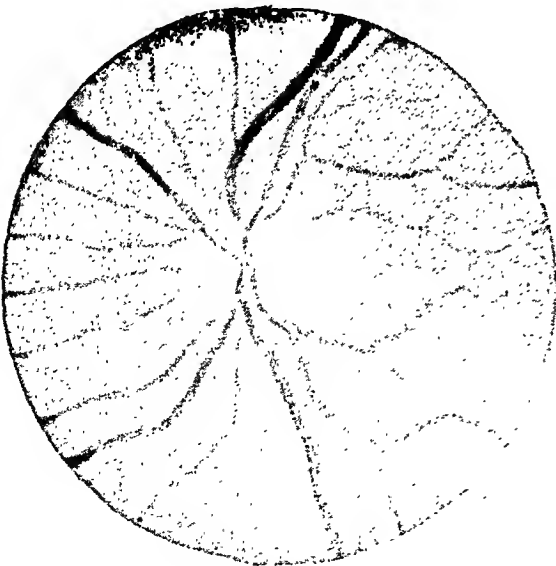


Fig. 1 (Sanders). Photograph of fundus of left eye before occlusion, showing normal appearance.

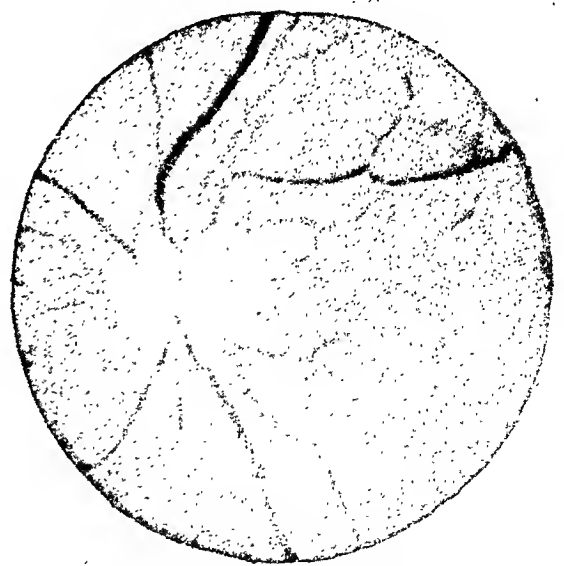


Fig. 2 (Sanders). Photograph of fundus of left eye during occlusion, showing disappearance of retinal arteries.

and can be seen in outline, but the nasal vessels, which are well seen in figure 1 seem to have disappeared entirely. There is no marked change in the veins, although in Harbridge's case there was venous occlusion also, and in Bruner's there was stasis with breaking up of the column. Although not well shown in the photograph, the disc became very pale, a change noted by all previous observers. The photographs do not show the marked changes in the appearance of the retina, which were very apparent ophthalmoscopically. Soon after the occlusion, the retina became very hazy, the appearance being similar to that seen in permanent occlusion or embolism of the central artery. This appearance disappeared so quickly after circulation was reestablished, that it was probably due to a loss of transparency on a reversible chemical basis, as an anoxemia or a retention of metabolic products. The return of vision was not coincident with restoration of circulation, but was delayed for several seconds until the retina had had the opportunity to regain its normal state. In permanent occlusion of the central artery or embolism, the opacity of the retina is usually attributed to edema or necrosis,¹⁵ and has been noted as soon as 15 minutes after onset of blindness.¹⁶ As our patient regained normal function several times after occlusions lasting as long as 10 minutes, it seems probable that the haziness of the retina seen in embolism is on a reversible chemical basis, at least for some time after onset. Any treatment of embolism that could restore circulation within several hours, would probably get an excellent visual result.

Figure 3 shows the fundus after the patient had recovered vision, having been taken about 10 minutes after figure 2. The arteries and retina are now normal. The chief change is the dilation and distention of the veins.

In any occlusion of a central retinal vessel, four processes, in combination or separately, are usually responsible, these being embolism, thrombosis, endovascularitis, and spasm.¹⁵ Verhoeff¹⁷ in 1907 was the first to emphasize that the so-called thrombosis of the central vein was essentially an obliterative endophlebitis. In 1913 Coats¹⁸ presented a classic account of the pathological changes occurring in

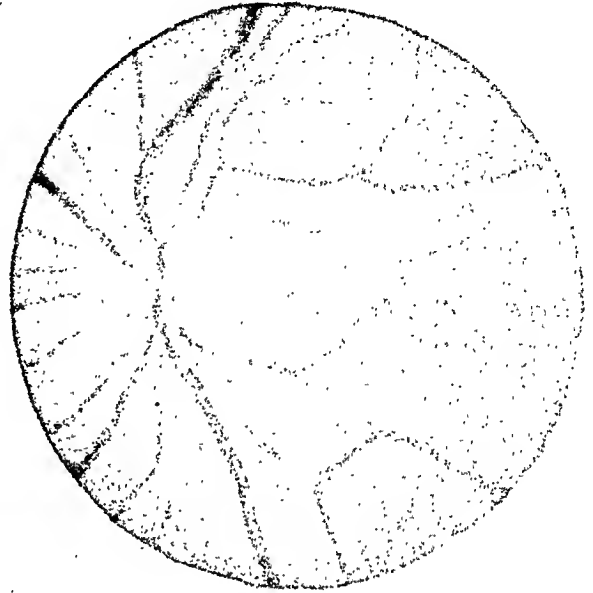


Fig. 3 (Sanders). Photograph of fundus of left eye about 10 minutes after occlusion, showing dilated retinal veins.

the central vessels of the retina, consisting primarily of an endovascularitis characterized by an endothelial proliferation. He states that it seems to be chiefly a matter of chance which finally occludes first, the almost obliterated artery or the vein, but that a few of the cases are definitely embolic in origin. Lately this view has been substantiated by Minton¹⁹ who, after studying 54 cases, states that occlusion of the central artery very rarely (10 percent) occurs in young people, usually as a result of valvular disease of the heart, probably being true embolism, but over 90 percent occur in people over 50 years of age, as a result of slow and gradual obliterative endarteritis. Even so, the most common

term for this condition in general use today is embolism of the central artery. Coverdale¹⁵ believes that the most satisfactory explanation of the great majority of cases of occlusion of the artery not definitely attributable to endarteritis is embolism, which may occur in the absence of any other sign of cardiovascular disease.

In evaluating the causative factors in this particular case, of the four mentioned above, embolism and thrombosis are obviously impossible, leaving only endarteritis and spasm to be considered. In this patient there is definite evidence of generalized arterial disease, as shown by the slight elevation of blood pressure, the palpable radial and dorsalis pedis arteries, the widening of the aortic shadow on fluoroscopic examination, and the slight sclerosis of the retinal arteries.

Since an attack could almost be elicited at will and since the patient was so completely coöperative, this case offered a unique opportunity to study the precipitating factors. It was first thought that the exercise caused an elevation of the intracranial pressure which was transmitted down the intervaginal space, and this closed off the central artery at the site of a localized endarteritis. This theory was disproved by the lack of response when the intracranial pressure was elevated to known high levels. The lack of effect of posture and hyperventilation were also shown by experiment. It was found that the occlusion took place when the blood pressure was elevated to around 180/100, which was most easily done by exercise. It was also noted that occlusion failed to take place after use of vasodilators, such as nitroglycerin.

Although arteriospasm seems definitely to be precipitating factor, the presence of the organic arterial disease cannot be ignored. It seems likely that the exercise causes an elevation in blood pressure with

an accompanying arterial spasm. The resultant narrowing causes a complete occlusion in a central artery, whose lumen is already partially blocked by an endarteritis. The presence of the local arterial disease might act also as a localizing factor, causing that particular artery to go into spasm. A similar condition is well recognized in the heart, anginal attacks being caused by an intermittent occlusion, based on spasm, in a diseased and partially occluded coronary vessel.

In general these patients seem either to develop a permanent occlusion, which obviously results from a progressive increase in the endothelial proliferation with complete occlusion, or to recover in a short time, as our patient had attacks for only three weeks, Harbridge's for 10 days, and Bruner's for one week. Although vasodilators may aid in reducing temporarily the number and severity of the attacks, it seems doubtful that they could have much effect in producing permanent recovery. As the blood pressure of 118/85 noted at the last visit was the lowest recorded, it is possible that the disappearance of the attacks in this patient is due to a general reduction in arterial tone and a lessened tendency to arteriospasm, because of the removal of some pressor substance. The increase in the sclerosis of the retinal vessels suggests the possibility that progressive changes in the arterial walls has made them incapable of spasm.

The treatment of this condition should not only consist of removal of precipitating factors, as exercise in this case, elimination of known vasoconstrictors as tobacco, and the use of mild vasodilators, but also should attempt to lessen the number of attacks so as to minimize the possibility of a permanent occlusion. As there is an ever-present danger that a temporary obstruction may become permanent, one should always be prepared to treat a permanent occlusion by the accepted

means; massage, paracentesis, and the use of strong vasodilators as acetylcholine.²⁰

We wish to thank Dr. Dan Myers for his aid and advice in the medical examination of this patient.

SUMMARY

1. A case of intermittent occlusion of

the central retinal artery repeatedly observed ophthalmoscopically is reported.

2. Fundus photographs taken before, during, and after an attack of occlusion are discussed.

3. The causative factors of endarteritis and arterial spasm are evaluated.

640 South Kingshighway.

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STANDARDS FOR OUT-PATIENT SERVICE IN OPHTHALMOLOGY*

CONRAD BERENS, M.D.

New York

Because of the need for information concerning the proper organization and equipment for hospitals and clinics wishing to develop an out-patient service in ophthalmology, a committee of the Associated Out-Patient Clinics of New York City prepared standards for out-patient service in ophthalmology in 1923.¹ These standards have served a useful purpose not only in New York but in other cities for those wishing to develop new clinics or reorganize established departments. However, because of advances in ophthalmology and changes in clinic procedure it was deemed advisable to revise these standards. Therefore, at the request of the Welfare Council of New York City and the National Society for the Prevention of Blindness, a committee of ophthalmologists was appointed by the Section on Ophthalmology of the New York Academy of Medicine.[†]

A recent survey of clinics in New York² indicates that although there has been considerable improvement in clinic practices as compared with those reported in previous communications,^{3, 4, 5} the organization of our eye clinics not only from the standpoint of professional services but also from the nursing and social-service point of view could still be improved. The nursing and social-service conditions and recommendations approved by the committee may be obtained from the Welfare Council of New York City.**

* Presented before the Section on Ophthalmology, New York Academy of Medicine, November 15, 1937.

† Committee on Standards for Out-Patient Service in Ophthalmology of the New York Academy of Medicine: Ellice M. Alger; Thomas H. Johnson; Osborn P. Perkins; Henry R. Skeel; David H. Webster; Webb W. Weeks; and Conrad Berens, chairman.

The following recommendations for medical standards for out-patient service in ophthalmology were approved and accepted by the New York Academy of Medicine on May 16, 1938.

I. ORGANIZATION OF OUT-PATIENT OPHTHALMOLOGIC DEPARTMENTS

Although eye out-patient departments as unattached eye dispensaries and ophthalmological departments in unattached general clinics are looked upon with disapproval at present, out-patient ophthalmologic departments may have to be organized in the following ways: (1) as an out-patient service of an eye hospital; (2) as an unattached eye clinic; (3) as a unit of service in the out-patient department of a general or special hospital, and (4) as a department in an unattached general clinic. Bearing in mind various types of organizations, the committee has suggested standards which may be adapted to any ophthalmologic service.

1. Administration.

a. Board of trustees. If the out-patient service is administered by the board of trustees of the hospital, a subcommittee of the board of trustees should give special attention to the out-patient department and hold regular meetings with the medical director of the out-patient department and the clinic staffs.

The medical board of the out-patient department and the eye dispensary should have a practical liaison with the board of trustees.

Close relationship should be maintained between the board of trustees, the super-

** Welfare Council of New York City, 44 East Twenty-third Street, New York, N.Y.

intendent of the hospital, the director of the out-patient department, and the chiefs of clinics through regular conferences at which problems of administration relating to the ophthalmologic service should be discussed.

b. Medical board. If the medical service of the out-patient department is administered by the medical board of the hospital, the medical staff of the out-patient department should have representatives on the medical board who should be elected annually and who should report regularly to the medical staff of the out-patient department on action taken at meetings.

If the medical service of the out-patient department is administered by an independent medical board, the ophthalmologic service should have representatives on the medical board who should be elected annually and should report regularly to the staff of the ophthalmologic service on action taken at meetings.

The medical staff should hold general conferences at least three times a year. Members of the medical staff should be required to attend these conferences. Subjects for discussion might include evaluation of service rendered, coördination of the work of the clinics, research, and allied topics.

2. Director of Out-Patient Service.

There should be regular meetings of the superintendent, the director of the out-patient department, and the chiefs of the clinics to discuss clinic and administrative problems.

3. Other Services in the Out-Patient Department.

The following services should also be available to the ophthalmologic service through other clinics of the out-patient department or by arrangements with hospitals or special medical institutions: general medicine and complete laboratory services including pathology, bacteriology,

serology, and roentgenology; ear, nose, and throat; dermatology and syphilis; neurology and neurosurgery; dentistry; physiotherapy and psychotherapy; departments of research, photography, and art.

No eye clinic should function without adequate contact with general medicine, ear, nose, and throat service, and complete laboratory facilities including roentgenology.

II. PHYSICAL PLAN OF CLINIC

1. Space and Arrangement.

There should be an adequate number of rooms conveniently located for patients and professional staff. Large clinics should include a clinic room for diagnosis and treatment, a dark room, refraction room, clinic operating room, hospital operating room, room for roentgenology, and rooms for physiologic optics, perimetry, and motor anomalies. All rooms and equipment should be adequately lighted.

2. *Equipment.

*Trial cases. One for two ophthalmologists engaged in refraction.

*Trial frame. One for each ophthalmologist engaged in refraction.

*Retinoscopy racks. A set for two ophthalmologists engaged in refraction.

*Retinoscopes. One for two ophthalmologists engaged in refraction.

*Ophthalmoscopes:

*Electric. One for three ophthalmologists.

*Plain. One for two ophthalmologists.

Binocular. One for entire clinic.

Tonometer. Two for each clinic. *In smaller clinics one is sufficient.

*Instruments for minor operations: eyelid everters, tongue depressor, spuds.

* Minimum.

- *Sterilizer. One for clinic.
- *Corneal microscope. One for clinic.
- *Perimeters. One hand perimeter and one on perimeter table.
- *Tangent screen. One for clinic of 10 ophthalmologists.
- *Near type. One illiterate and one standard for each ophthalmologist engaged in refraction.
- *Suitable test objects for perimetric and tangent-screen work.
- *Color tests. Wool tests, preferably Jennings. One for clinic.
- *Ishihara test. One for clinic.
- *Prince rule or substitute. One for each ophthalmologist.
- *Test cards for distance adequately illuminated. One illiterate and one standard. One for two ophthalmologists engaged in refraction.
- *Prisms: Square. One set for two men (0.5 to 50 prism diopters).
- *Arrangement for muscle testing. Light with iris diaphragm and a Maddox rod. Red diplopia glass. One for two ophthalmologists engaged in refraction.
- *Tests for stereopsis. *Stereoscope with special cards for stereopsis. One of the major amblyoscopes and slides. Howard six-meter stereoscope.
- *Transilluminator. One for each clinic of 10 men.
- *Exophthalmometer. One for each clinic.
- *One treatment table for two ophthalmologists; chair for each man.
- Two surgical chairs and surgical tables (one of each for small clinic).
- *Binocular loupe. One for each ophthalmologist.
- *Lenses for oblique illumination and indirect ophthalmoscopy. One for each ophthalmologist.

This equipment should be conveniently arranged and some member of the ad-

ministrative staff should be responsible for seeing that it is replenished and kept in good order.

3. Supplementary Services.

Every institution should have its own facilities for manufacturing lenses, or employ an optician on a full- or part-time basis to fit and make glasses, or contract with a wholesale firm to furnish materials at wholesale prices and sell the glasses to patients at the clinic. Glass should be of good quality properly ground and the frames properly fitted.

The pharmacy should be under the direction of a registered pharmacist. A standard formulary should be adopted and revised every year. It is permissible to use numbers provided *written* directions are given by the physicians. In the use of poisonous drugs it is advisable to have directions printed in several languages.

III. ADMISSION OF PATIENTS

1. Standard Admission Blank.

A standard admission blank adapted to meet the needs of the clinic should be used by all out-patient departments.

2. Responsibility for Admission of Patients.

Decision as to the admission of patients to clinics should be based on the service available to meet the medical needs of the patient and in accordance with his ability to pay. Final decision should be made by a medical admission officer who should decide whether the case is an emergency and if appropriate service is available, and to which clinic the patient should be referred. The decision concerning the patient's ability to pay should be made by the director of admissions.

3. Limitation by Age.

No children under 14 years should be

admitted to the clinic unless accompanied by an adult, except in an emergency. Agencies referring children to a clinic should be responsible for seeing that an adult accompanies them.

4. Fees.

It is desirable that stated fees be charged for refractions, perimetric examination, special examinations, treatments, and for medicines. Patients unable to pay these stated fees should be treated at reduced rates or free after careful investigations of their financial status.

5. Prevention of Overcrowding.

Only patients who are being examined should be permitted in the clinic room. Patients with a solution of drugs in their eyes or waiting for examination should remain in the waiting room.

IV. CLINIC PROCEDURES

1. Routine History and Examination.

A routine method of taking the history and making the examinations should be standardized in each clinic. Wassermann tests should be made routinely in all cases in which syphilis may be an etiologic factor. Written or printed directions should be given for all treatment.

2. Revisits.

Patients making revisits should be referred if possible to the physician who examined them originally. His name should be in a conspicuous place on the record and on the folder.

3. Referring Patients to Private Physician.

Physicians on the clinic staff who are willing to have patients referred to their private offices should list their names and the maximum fee charged with the director of admissions. The list should be passed upon by the board of surgeons. Patients should be referred to the physi-

cians on the list who are on duty the day the patient obtains such a list.

4. Records and Filing.

All clinic records should be filed in a central file. Out-patient records should be included in a unit record system. Records should be cross-indexed by diagnoses and operations. The standard nomenclature of diseases should be adopted for use in each institution. Some member of the clinic staff should be responsible for the completeness of the clinic records. A summary of the social history should be made a part of the record.

5. Statistics.

Standard forms should be used for the collection of statistics and monthly reports made from these.

6. Periodic Evaluation of Clinic Procedure.

There should be a periodic review of the type of work done in the out-patient department and an evaluation of the results. Discussion of the work of the clinic should be a regular part of clinic conferences.

7. Research and Teaching.

There should be a special department for research, for which the board of directors should see that funds are available, and every physician and student working in the clinic should be encouraged to do research. The resources of the ophthalmologic clinic should be used to a maximum in teaching practicing ophthalmologists, students, and resident physicians. The teaching should be organized preferably in relation to a medical school.

V. MEDICAL STAFF

1. Chief of Ophthalmologic Service, Chief Surgeon or Director.

a. Education and training. Medical degree from a grade-A medical school, reg-

istration to practice in the state of residence, and certification by the American Board of Ophthalmology. An interest in and an understanding of the medical and social aspects of diseases of the eye should have been acquired either through courses in medical school, or in postgraduate work, or experience in working with a medical social-service department of recognized standing.

b. Selection. The selection of the chief of the ophthalmologic service, chief surgeon, or director should be made by the medical board from a list of candidates proposed by members of the staff, ophthalmologists, or upon recommendation from one of the American ophthalmological societies.

c. Tenure. The chief of service should be appointed by the board of trustees for a definite term. A retiring age of 65 should be enforced by the trustees.

d. Duties. Planning with the superintendent and the director of the out-patient department concerning space, equipment, supplies, records, relation to other clinics, and so forth.

Selecting and supervising the staff and outlining their duties.

Giving general supervision to the examination of all patients in the clinic and assuming responsibility for standards of work maintained by the staff.

Consulting with associates regarding the diagnosis and treatment of certain cases.

Approving personally or through a designated representative each patient admitted.

Assuming responsibility for the standard of all surgical work.

Holding clinic conferences at least once a month and conferences with other departments at regular intervals.

Organizing and supervising the training of associates.

2. Senior Ophthalmologic Surgeon, Junior

Ophthalmologic Surgeon, Assistant Ophthalmologic Surgeon, and Clinical Assistants.

a. Education and training. Senior ophthalmologic surgeons, junior ophthalmologic surgeons, and assistant ophthalmologic surgeons should have a degree from a grade-A medical school, registration to practice in the state of residence, and certification by the American Board of Ophthalmology.

Clinical assistants should be graduates of a grade-A medical school and should be able to pass the examinations required by the hospital or clinic.

Formal courses of instruction should be arranged for the medical staff covering subjects included in the examinations of the American Board of Ophthalmology; namely, external diseases of the eye, ophthalmoscopy, anatomy and pathology, errors of refraction, motor anomalies, perimetry, relations of ocular conditions to diseases of other parts of the body, therapeutics and operations, and optics and visual physiology.

Medical schools, hospitals, and clinics offering postgraduate courses in ophthalmology should incorporate in their curricula lectures on the social significance of diseases of the eye, and the functions and practice of medical social service and follow-up in relation to eye clinics. Observation and practice in an ophthalmologic clinic having a well-organized medical social service should supplement these studies.

b. Selection. The selection of the clinical medical staff should be made upon recommendation of the chief of service with the approval of the medical board and the board of trustees.

c. Tenure. Reappointment should be made by the board of trustees on the recommendation of the chief of service and the medical board on an annual basis. Clinical assistants should be on probation

until they pass the examinations required by the hospital or clinic for advancement to the next grade.

d. Duties. The senior ophthalmologic surgeon, junior ophthalmologic surgeon, or assistant ophthalmologic surgeon should assume the duties of the chief of the ophthalmologic service during his absence.

Assistant ophthalmologic surgeons should make diagnoses, treat patients, and perform and assist in operations.

Clinical assistants should make diagnoses, treat patients, perform refractions, assist in operations, and operate under supervision.

House surgeons should aid the director or his representative in the examination and admission of patients to the hospital, assist in operations, and perform certain operations under supervision. They should be responsible to the chief of the ophthalmologic service for the care of designated out-patients.

Clinical clerks (medical students) should assist the staff in taking histories, administering minor treatments, and so on.

3. Size of Staff.

The staff should be adequate to care properly for the patients admitted in the clinics. In a clinic where all types of patients are accepted and there is available a complete staff of ophthalmologists,

nurses, medical social workers, and lay assistants, each ophthalmologist may examine an average of 10 new patients, or 15 old patients, or 5 new and 10 old patients, in one hour exclusive of refractions, visual fields, and other detailed examinations. No ophthalmologist should be required to perform more than six refractions an hour.

4. Professional and Lay Assistants.

The physician should be relieved of duties not directly concerned with the professional care of patients by the delegation of such duties to trained technical assistants: executive, nursing, medical social service, and clerical.

Studies of visual acuity, and of perimetric and routine muscle examinations may be made by trained technical assistants. A medical social worker should be on duty during each clinic session.

SUMMARY

Standards for out-patient service in ophthalmology including administration, plan and equipment, admission of patients, clinic procedures, selection, and tenure and duties of the medical staff and lay assistants have been prepared and presented in order to facilitate the development of new clinics or the reorganization of established departments.

35 East Seventieth Street.

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OPHTHALMIC SURGERY AT MISSIONS IN INDIA*

SAMUEL G. HIGGINS, M.D.

Milwaukee, Wisconsin

The usual visit to India for instruction in cataract surgery consists, I am informed, of a six weeks' residence at the clinic of Sir Henry Holland or other established clinic. The appointment is made in advance and a contribution to the clinic is accepted. Instruction is given in the Smith Indian intracapsular cataract operation, after which the visitor is permitted to perform many operations.

Six years ago Dr. Watson Gailey of Bloomington, Illinois, went "on his own," having made tentative appointments to visit mission hospitals through missionary societies in the United States. He planned to return last winter and had asked Dr. Walter Stevenson of Quincy, Illinois, to go with him. When Dr. Gailey was unable to leave, Dr. Stevenson asked me to accompany him. The "cataract season" may be any time in the winter selected by the surgeons. A white person would not choose to visit India in March and during the summer when the temperature every day in Central and Southern India is 115 to 120 degrees.

Attendance at the International Congress of Ophthalmology in Cairo, Egypt, delayed our arrival at Bombay to the latter part of December. We spent a week visiting clinics, offices, and hospitals in Bombay. Most of our time was spent at the clinic of Sir Jameson Duggan at the Jee Jee Boy Hospital of the Bombay Medical School, where Dr. Duggan is the Professor of Ophthalmology. A study of his wet specimens, showing the dissection of the course of the facial nerve, was an aid in the application of block anesthesia.

* Presented before the Chicago Ophthalmological Society, October 4, 1938.

Numerous cases of trachoma were treated at the dispensary. Many patients with chronic trachoma remained at the hospital two weeks for daily treatment before undergoing cataract extraction. Dr. Duggan remarked that he would perform but few cataract operations if he did not operate on patients who had had trachoma. His low incidence of infection may be due to the technique he always uses in cases of hypermature cataracts. It consists essentially in opening the capsule with the cataract knife during the corneal incision. The incision is made at the equator, with the knife emerging at the limbus above with a wide and long conjunctival flap. The lens is not punctured low, as the keratocystotomy of Gayet, nor is Erwin's flap made. Duggan punctures the lens at the lower margin of the pupil and, by drawing the point, makes a slanting incision in the capsule about 3 mm. in length. The knife then promptly continues to the opposite limbus for the completion of the incision. The anterior chamber fills quickly with the milky fluid of the pearly white hypermature lens. Copious washing with a thin pointed irrigator clears the anterior chamber. The nucleus is extracted without iridectomy by pressure with a spoon or hook. This is followed by more irrigation. The iris is replaced. The long conjunctival flap is not sutured. The eyes that I saw at the end of the week evidenced the success of this method in his hands.

The dispatch acquired by Indian surgeons from their volume of operations is illustrated by the excision of a tear sac which I saw Dr. Duggan do in three minutes. I asked him what he considered the cause for so many cataracts in India. He

mentioned only the bright sun.

We proceeded from Bombay direct to four missions that are off an irregular line through the Central Provinces, Berar, and Bihar, toward Calcutta. Here we were instructors rather than students (fig. 1). Our clinics were visited daily by the civil surgeons and doctors from neighboring towns. We followed in India the methods we used at home. Too frequent iritis and iris prolapse with the old extracapsular extractions had turned our attention to intracapsular operations. We had seen Colonel Smith operate but were discouraged by vitreous loss, high pupils, and much astigmatism associated with the Indian intracapsular operation. We had each, years ago, purchased a Barraquer machine and used the method many times. Hammock pupils following operation, together with care of the machine, may be included among the reasons for abandoning that method. We were both much encouraged after witnessing Professor Elschnig operate at the Illinois Eye and Ear Infirmary. Since that day we had independently followed the technique described by him and chose to do so in India. The essential feature is the use of a smooth capsule forceps to grasp and aid in freeing the lens. Sauvincan's, Graefe's or Pana's forceps described many years ago, when made smooth, or Schmidt's spoon forceps may be as effective as one of the recent models. I came to use the Arruga forceps more than any other. Occasionally when the Arruga failed, one of the other smooth forceps would take hold—more often the Arruga held when one of the others slipped. Dr. Stevenson frequently used his specially constructed fine-pointed tie forceps as a capsule forceps. Possibly it is the nice approximation rather than the size of the blades that is essential. The usual clear eyes without congestion, freedom from iritis, or prolapsed iris, prompt healing, and excel-

lent vision with round pupil and not much astigmatism encourages me to continue with the Elschnig intracapsular method of extraction.

It should be understood that all precautions by way of examination before operation were carried out and contraindications observed. Tonometer tension was



Fig. 1 (Higgins). Native with drum and sandwich sign announcing the arrival of two American ophthalmic surgeons.

taken when suggested by the digital method. Only two cases presenting unusual risks were accepted. The results were fortunate. One was extraction of cataract in a patient shaking with paralysis agitans and another with tension of 50 mm. Hg. In the latter case, the man had some vision in the other eye. Leavoglucosan was used to reduce the tension.

When patients off dusty roads, who have never used soap, are accepted, one may expect complications. Unexplained infections as we see them here were scarcely more frequent in India. Dr. Stevenson used intramuscular injections of milk immediately after operation in a series of cases. After I had had two infections when using the Duggan conjunctival flap

in 24 patients with trachoma, I abandoned that technique. Either my preliminary treatment was not effective or the diagnosis of healed trachoma not accurate. After seeing the infected cases I bandaged trachoma eyes over night. A thin yellow secretion was present next morning in some eyes and not in others. I felt it might be safe to operate on the eyes without secretion, but that was after the experience and I did not operate.

Hypermature lenses are removed nicely with smooth capsule forceps. Occasionally the capsule would break as the lens was emerging through the incision. The capsule could be easily removed with a capsule forceps or often better with the tie forceps. Prolapsed iris was rare. Homatropine was used before the operation. Eserine ointment was placed between the lids after Elschmig extractions. Vitreous did at times present, but not in amount nor frequency seen with other techniques. There were three cases of explosive hemorrhage—digital tension normal. The first was mine, occurring in a man as soon as he reached his bed. One occurred two days after operation. (We should have stopped operating at an even number.) The third took place immediately after the incision and was complete on the operating table. It was on the 1,059th eye. The patient's other eye was not operated on.

We followed the custom in India of operating on both eyes at one sitting. In the last mission we made the incision in the patient's left eye with the left hand. The experiences encountered with one eye were always repeated in the second eye—jumpy patient, failure to look down, fragile conjunctiva, hemorrhage in anterior chamber, contracting pupil, or presenting vitreous, and so forth. When the operation did not proceed as smoothly as desired on the first eye, I deferred operation on the other eye.

We used pontocaine in a series of cases but returned to 5-percent cocaine drops for local anesthesia. The O'Brien injection of the facial nerve was made in all cases. The patient usually responds when hard bone is encountered. The needle is inserted anterior to the incisura intertragica. Properly executed one and not more than two cubic centimeters of novocaine is sufficient. The O'Brien injection may be supplemented by the Van Lint method. A long needle is necessary to place the novocaine at and beyond the superior and inferior orbital notches. We usually placed a bridle suture beneath the tendon of the superior rectus muscle. No novocaine was injected in the muscle.

Retrobulbar injections were made in all the intracapsular extractions. The needle was inserted, as we saw Elschmig do it, through the lower lid. It is worthy of note that in over 1,000 extractions there was no complication, infection, swelling, or other undesirable sequela due to the injections of novocaine. In one of my cases a hemorrhage immediately followed the retrobulbar injection. The needle may have been too long. The cataract was removed by me a week later with good surgical and visual results—usual technique including retrobulbar injection. Delay in making the incision after retrobulbar injection accounted for five lenses dropping into the vitreous. Prompt use of Reisinger forceps or the loop rescued them.

We preferred to make a small peripheral iridectomy to Elschmig's iridotomy incision. For this purpose we purchased very fine iridectomy forceps from Weiss in Cairo to supplement the forceps we brought with us. No matter how tiny a bit of iris was excised, the opening was always large enough.

Dr. Stevenson preferred conjunctival sutures. He said his became untied or pulled out of the conjunctiva after a week or so. When I knew I would remain for

a week after the operation to remove it, I continued using in all cases the mattress corneal scleral suture that I described to this Society in 1931. In no case was there a complication, infection, or other unfavorable result from the fine silk thread in the cornea.

The total number of miscellaneous operations we performed at the four missions nearly reached the figure for cataract extractions. These included operations for glaucoma, squint, trachoma, pterygium, pannus, tumors, entropion, ectropion, as well as excision of tear sac, many optical iridectomies, some plastic operations, and, of least number, enucleations. Refraction of 100 girls between the ages of 7 and 20, at a Methodist school, brought in five squint operations. The errors of refraction in these Indian young people were of the same variety we see here and in about the same proportion. I was surprised to meet many cases of usual and a few of high myopia among adults about the missions and in the towns.

The natives came for help when blind and at the end or height of inflammatory conditions rather than for early or preventive treatments. Prince's trachoma prescription of glycerine and copper solution was frequently prescribed for home use. Patients receiving a zinc collyrium for conjunctival congestion frequently returned with the request for the stronger eye drops. The simple natives welcomed the magic of the needle. This observation was confirmed by mission doctors, who told me they could induce patients to return for specific treatment by injections who would not continue with oral or dermal remedies at home.

We rode a day and a night from Asansol near Calcutta to Lahore in Northern India in compliance with Gailey's admonition to witness the incision and dexterity of Dr. Mathra Das. His incision is

very broad at the very juncture of the cornea and sclera, but within the cornea, although it always emerges through the cornea 1 to 1½ millimeters from the margin. While making the incision his spring-type (the Clark or Jullundur) speculum is raised and steadied by his trained assistant, who is neither a doctor nor nurse. The speculum is removed after the incision is made. From here on the assistant separates the lids as may be required with his fingers. A small iridectomy of the sphincter at the pupillary margin is made with ordinary iris forceps and curved scissors. The lens is pressed out with no exaggerated motion. The pressure of the hook when first applied may be directed toward the optic disc, but the motion that I saw was upward—a quick even upward wiping out of the tumbled lens. The iris is quickly replaced. A drop of atropine solution and a bit of yellow oxide of mercury ointment precedes the application of the eye pad. Both eyes are bandaged; binocular operations are usual. There is no nerve-blocking type of akinesia nor suturing of lids or conjunctiva. Anesthesia is afforded by repeated dropping of 5-percent cocaine. Liberal washing with 1 to 5,000 bichloride solution immediately precedes the insertion of the speculum. The lids and face may or may not be stained with a weak iodine solution. The irrigation solution need not be dried from the face, neck, or ears. Counting the time from the beginning of the incision, after the eye is held by fixation forceps, to the moment when the iris has been replaced, the total time for Dr. Das to extract a cataract in the usual uncomplicated case is 50 seconds. During the past 35 years Mathra Das's total cataract operations up to the end of 1937 number 141,936. The largest number that he has done in one day was at a special clinic some miles from Lahore where he began operating at seven in the morning and

continued straight through until one o'clock at night. When he had operated on the last patient, the total for the day was 707 cataract extractions. This last figure was told to us by Dr. Das and the assistant who was with him. I quote the total number of operations from the printed "Statement showing the number of selected operations performed by R. B. Dr. Mathra Das Pahwa during the last 35 years" given to me by Dr. Das himself. I found no one familiar with Das's work who doubted the accuracy of these figures.

The number of cataract operations is less than half of the "total of selected operations each year." The grand total of all operations for the 35 years is 200,757. This total includes cataracts, iridectomies, rhinoplasty, hare lip, obstetric, tumors, bones, joints, and the operations we list in general surgery. Our urologists may be interested to know the list includes 87 prostatectomies, 62 external urethrotomies, and 1,137 operations for stone, which I assume to be of the urinary tract. Many may be surprised that Dr. Das's list of operations near the city of Lahore in Northern India near Kashmir does not include the words goiter nor thyroid gland. For the edification of our nose and throat associates, I can say that tonsillectomies are conspicuous by their absence. The list does not mention tonsils nor tonsillectomies.

The results I saw of Dr. Das's operations were surprisingly good. The eyes I saw were not inspected before the fourth day. The scleras were moderately clear. They did not show the congestion and iritis so often present with the older extracapsular operations when portions of capsules or lens were left in the anterior chamber. Many cases I saw showed hammock pupils, which I believe is inherent with the Indian intracapsular operation. No surgeon anywhere can continue per-

forming many cataract operations unless visual results are usually satisfactory to his patients.

Under the assumption that visual requirements are not so exacting by patients in rural India as they are in the United States, and that the number of operations a surgeon could perform in one day by more elaborate technique would be markedly curtailed, I admit that the Indian operation may be the choice for India.

Dr. Das's cataract patients are permitted to sit up in bed after 12 hours. On the third day they may sit in an easy chair in the same room. On making rounds at his large free clinic, called the Emerson Eye Hospital, which he supports with his own money, I did not observe patients taking the liberties his printed directions permitted. Regarding spectacles his printed instructions read "(a) Patient must use spectacles after operation, otherwise he will not have good vision. (b) Spectacles are to be used 2½ months after operation when the eye is entirely free from redness."

One day, after daily attendance of four or five days, Dr. Das demonstrated his technique by having us rest our hand in his while making the incision. When we held the hook his hand directed pressure and escape of the lens. One of his doctors recorded our names in the daily "log book" as assistants in those operations. This was after we had together completed our list of over 1,000 cataract operations at the missions. On another occasion, after completing a dozen or more cataract operations he ended the surgery of the morning by doing as neat and clean a hernia operation as I have ever seen, on a boy under chloroform anesthesia. He invited us to accompany him to a special clinic to be held in two weeks. I was led to believe that we might do some operating there. An ophthalmologist from Port

Said, Egypt, visited Mathra Das while we were there. He left after three days telling us that he wished to go where he would be permitted to operate rather than observe. His home was formerly in Germany where he was well trained.

While riding with Dr. Das in his car, making house calls and going past the beautiful Shalimar gardens to his Emerson Eye Hospital, he good naturedly submitted to the innumerable questions of two American doctors. It seemed to us that his charm and smile were rivaled by only one contemporary in the world today. He told us that he asked the Institute of Tropical Diseases in Calcutta to conduct researches to determine the cause of cataracts. They did not comply with his re-

quest. He then leisurely reviewed what he has considered clinically to be the cause of senile cataracts in India. First and foremost was the bright sun. The rural inhabitants are not protected by wearing hats or visors nor do they wear dark glasses. Most of the days of the year are without clouds or shade. Next in importance he mentioned errors of refraction. He has great difficulty in getting his patients to wear glasses, especially, as he said, the ladies. He admitted that intercurrent diseases and restricted diet might be etiologic causes. He disregarded the suggestion that early maturity and early senility were factors.

324 East Wisconsin Avenue.

PERIRRHAPHY IN THE TREATMENT OF CORNEAL ULCERS AND OPACITIES AND OF INTERSTITIAL KERATITIS

EGISTO MORETTI, M.D.

Catania, Italy

At the Congress of the Italian Ophthalmic Society held at Rome in October, 1937, I reported a new operation, perirrhaphy, which I had used in many cases of corneal pannus due to trachoma, of ulcers, of kerato-hypopyon, of corneal opacities, and of interstitial keratitis.¹

In the present report I shall not deal with the results obtained by perirrhaphy in the treatment of the keratitis of trachomatous pannus (the results in later cases of which confirm those already published), but shall examine particularly those obtained in the treatment of other corneal lesions.

The technique of perirrhaphy is the following: After the usual operative preparation, anesthesia is obtained by instillation. A blepharostat is applied and fixation with forceps, to steady the globe. At 3 millimeters from the cornea in the external sector (at the 9-o'clock position in the right eye, and at the 3-o'clock position in the left), a needle armed with no. 3 silk is carried completely around the cornea, using a long suture, usually 5 to 7 mm., from point to point, to form an episcleral ring. The ends of the thread are left long, 5 cm., and are carried out at the external corner of the eye—the suture begins in the right eye at the 9-o'clock position and in the left eye at the 3 o'clock position—and are fixed with adhesive to the skin.

Atropine and dionin ointment, or one of xeroform-optochin, is applied. The monocular bandage should be renewed until fluorescein stains the ulcerous surface; the patient should wear a dark lens to protect the eye.

Forty-six corneal ulcers have been

operated on according to this method, 34 of which were trachomatous (18 with a slight pannus) and 12 nontrachomatous; and 11 corneal ulcers with hypopyon (7 trachomatous and 4 nontrachomatous).

Postoperative treatment was as follows: Six to eight hours after the operation, when the bandage is changed for the first time, an intensive hyperemia is noted at the bulbar conjunctiva, with more or less extension of the hyperemia and edema of the palpebral conjunctiva. After the conjunctival fornices have been carefully irrigated with sterilized water, warm poultices are applied for 10 minutes and then antikeratitic ointment of atropin-dionin-xeroform and optochin is applied. The poultices and application of ointment are made three to four times a day until the ulcer is perfectly clean. Each morning the silk thread is moved to activate the hyperemia.

The results in cases of simple ulcer after operation by perirrhaphy when considered from the anatomic semiologic standpoint fall into two groups: Group 1, trachomatous and nontrachomatous ulcers that are limited to the epithelial layer, to Bowman's membrane, and to the most superficial portion of the corneal parenchyma. In cases of superficial ulcer, perirrhaphy acts immediately, and after two to four hours the pain—if there are no iritic complications—diminishes markedly; after eight to ten hours it has completely disappeared. The ulcerated zone appears on the next day to be undergoing repair, and in the small ulcers presents only some points that stain with fluorescein. It is certain that the progress of the ulcer—both superficial and deep—is

immediately arrested by the operation. After three to four days the ulcer is perfectly clean.

Perirrhaphy used in 26 such cases was followed in every instance with the described postoperative course; in two cases there was healing on the seventh day; one became exacerbated and required galvano-cautery.

In the second group are included ulcers that have infiltrated into the deeper layers of the cornea. Nine of these were operated upon: four healed promptly, two healed very slowly, and the cornea was lustrous only after 16 days; and three became aggravated and had to be extensively cauterized.

From the reports of patients, it is learned that the ulcers that were localized outside the corneal zone affected with trachomatous pannus recovered faster together with the pannus.

Corneal ulcers with hypopyon show very encouraging results. In these cases attention must be given to the lacrimal passages; in cases of chronic dacryocystitis, dacryocystectomy is performed together with the perirrhaphy, or the dacryocystorhinostomy of De Lieto Vollero² or Nichelatti.³ These in many cases have been attended with excellent results.

Ulcers with hypopyon are also to be divided into the same two groups as are the cases of simple ulcer; namely, the superficial and the profound. In the first group the pain diminished after eight to nine hours and disappeared within 18 to 20 hours. The progress of the ulcer was immediately arrested, and usually after four to six days the ulcer had healed completely and the hypopyon had disappeared. Of six cases in this group, four recovered in the described manner; one after 11 days, but even in this case the progress of the ulcer was arrested immediately

after the operation. One case, however, healed only superficially while the deep infiltration progressed intensively, so that galvano-cautery was indicated.

In cases of the second group, in which the ulcers were large and deep and the hypopyon high, perirrhaphy brought

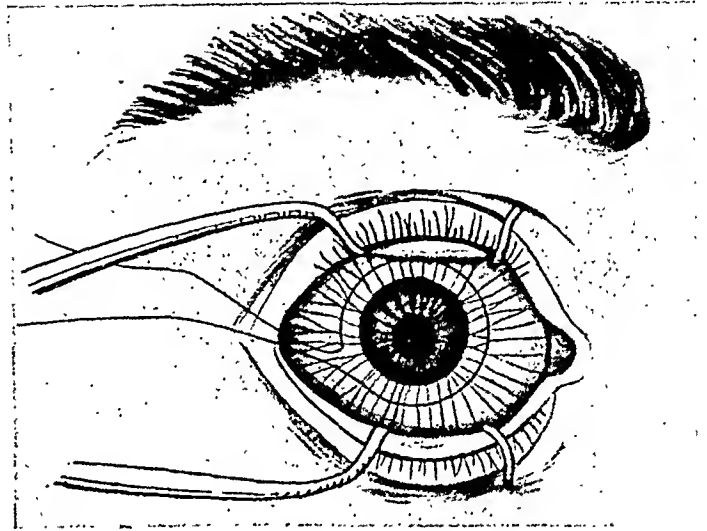


Fig. 1 (Moretti). Episcleral ring of sutures.

about a diminution of the pain, but did not succeed in healing the ulcer. Of five cases, only one recovered, after 22 days.

In such cases a reserved prognosis was made at the first examination, for the corneal destruction had already progressed extensively on the surface and into the deeper layers of the cornea. These patients had no relief from perirrhaphy, with one exception. After 24 hours they required electro-cautery and protein therapy (caseal-calcium). But in some patients even in spite of perforating electrotherapy the process was not controlled.

The worst cases of keratitis hypopyon were found in mowers' keratitis.

It is very important to note that the iritis and iridocyclitis that accompanied the different types of ulcers and that are caused by the toxic products of the organisms infecting the ulceration, were improved by perirrhaphy.

In order to understand the real efficacy

of perirrhaphy in the treatment of corneal ulcers, clinical investigations were made to obtain controls. Certain patients with simple superficial ulcers were treated with perirrhaphy and the described medical course; others, with the same clinical symptoms, were treated only medically. The former recovered from the ulcer quickly, as has already been described in this type of ulcer. But in the latter, treated only with medicaments, the ulcer healed slowly and often extended dangerously, threatening the integrity of the eye.

In some patients, treated without success with ointments and protein therapy, we observed that perirrhaphy at once effected improvement. These facts clearly prove that the effectual agent is perirrhaphy. It is superfluous to say that in the cases in which perirrhaphy succeeded in healing the simple corneal ulcers or those with hypopyon, the remaining opacity was not dense and was definitely limited to the ulcerous zone, a result difficult to obtain with electrocautery at a temperature controlled to avoid great destruction of corneal tissue.

In order to obtain partial or total transparency of corneal opacities resulting from ulcers, we found that it is well to leave the thread of silk *in situ* for three weeks after the ulcer has healed.

As a basis for these observations perirrhaphy was performed on 63 patients with corneal opacities, 46 of whom had recent opacities from ulcers operated on in the manner described, and 17 with ulcers more or less old. The operative technique was always the same; only the post-operative treatment was modified in the following manner: In the morning, at noon, and in the evening warm moist poultices were applied for 10 minutes. In the morning the thread was shifted slightly and an instillation of 10-percent dionin was made after application of the poul-

tices; in the evening, at bedtime, ointment with 1- to 3-percent yellow oxide of mercury was used.

In the 46 patients operated upon just when ulceration took place, this medical procedure was applied only for two to three days after complete recovery from the ulcer. Upon examining these patients it was found that the more or less brilliant success of perirrhaphy was in direct relation to the extent, thickness, density, and age of the opacity and the age of the patient; facts which determine any medical treatment of corneal opacities. Perirrhaphy accentuates the benefits obtained from the only medical therapy that is effective—warm, moist poultices, and dionin or thiosinamine and yellow mercury oxide—so that in cases where this therapy was ineffectual or only partially so, the surgical intervention succeeded in bringing about partial results in the first and very good results in the second group.

Upon examining the cases in which operation had taken place, we find some modification was obtained in the case of two large adherent leucomas. In three cases of dense, old, large leucomas covering the whole corneal surface, there was found partial clearing of a band, 2 mm. wide, along the limbus that had been practically useless for vision; in three other cases—one of these in an 18-year-old subject—this band was perfectly clear and larger so that an optic iridectomy could be performed, with increase of vision from 1/10 to 3/10 within four months. The other eye of this patient presented a violent irido-corneal staphyloma.

In 20 of the 26 cases of superficial ulcers operated on at the beginning of ulceration, we obtained a remarkable clearing of the opacity, and vision was reduced only slightly in close relation to the more or less central localization of the opacity. In four patients the reestablished vision was nearly 3/10, while in one patient, for

whom cauterization was also used, vision was only 2/10. In seven cases of superficial old corneal opacities, four cleared up well, two only partially, and one not at all.

In 10 cases with a remaining opacity of the cornea after ulcers had been operated upon with perirrhaphy, five cleared up well, four moderately, and one not at all. Of six cases with remaining corneal opacity after superficial ulcers with hypopyon had been operated upon at the time of ulceration, three healed well and three, because of the central situation of the lesion, suffered diminution of vision from 4/10 to 2/10. Of five cases of leucoma caused by severe keratohypopyon, operation with perirrhaphy brought healing up to a certain point in two, as well as in those in which electrocauterization was used. Another group of 10 patients with dense profound old opacities showed the following results: Six showed slight improvement and in four there was an initial clearing up to the limits of the leucoma. In all these cases the silk was left *in situ* for 24 days, according to the density of the corneal opacities.

In five cases of keratitis parenchymatosa we observed a good result from perirrhaphy. In three cases there was interstitial heredo-luetic keratitis, one in a 12-year-old and another in a 14-year-old girl, and a third in an 18-year-old male. The clinical observation showed the usual state of parenchymatous keratitis in the stage of vacuolization: One patient had suffered for eight months; another for six; and a young man also for six months. The manifestation was localized in one eye, and in every case special treatment had been given from the beginning of the disease. The day after perirrhaphy had been performed the cornea was seen to have the color of red meat; this continued for nearly a month. A fortnight

after the operation it was observed that the density had become less intensive in the infiltration, especially at the limbus and near the newly formed vessels; a fact that became gradually more noticeable, as regards both the extent of the lesion and also its depth. After a month's time had elapsed the patient could be considered clinically healed. The two girls recovered; the younger one in 45 days, the other in 54.

The silk thread was left *in situ* in the young man for 32 days and in the girls for two months. After perirrhaphy, energetic antiluetic therapy was given together with the local treatment of poultices, dionin, and atropine and yellow mercury oxide. There were no complications after the operation, but in the two patients in whom the silk thread remained two months we saw an ulcer of the conjunctiva which covered the thread. The laceration of the mucosa was not large, however, and caused no trouble.

Of the two other patients with bilateral interstitial keratitis of probably mixed tuberculous and heredo-luetic etiology, one was a young man aged 18 years who had for three years made the rounds of specialists and had taken only a few bismuth treatments. He came to our clinic as a blind patient, for the corneas were invaded by a thick scar of connective tissue furrowed by a few deeply lying thin vessels; typical of the most severe results of organized interstitial keratitis. All the usual therapy was used, including antiluetic treatment with iodine and calcium, but after 10 months of futile endeavor, perirrhaphy was undertaken. The two eyes were operated on one month apart, and we observed no immediate change in the color of the cornea. After 14 days a small strip began to clear, near the limbus and in the central sector of the cornea, so that the patient was able to distinguish something when the pupils

were dilated with atropine. The patient did not return after the silk thread had been removed—as in all the patients with keratitis parenchymatosa—one month after operation. None of the patients presented any complications; the bandage was taken off three days after the operation and the patients wore dark glasses for protection.

It is apparent that the results obtained with perirrhaphy in corneal ulcers, kerato-hypopyon, corneal opacities, and in interstitial keratitis, are due entirely to the hyperemia induced. The silk thread left in the episcleral tissue produces, like a foreign body, an intense mechanical irritation which causes the hyperemia of all the circulation in the anterior segment of the eye. As a result the nutritive metabolism becomes very active in the

cornea and arms it with an increasing resistance, augmenting the phagocytic elements that protect it. Perirrhaphy is thus a means of obtaining intensely and for a sufficient duration the objective of the various medical means. Therapy with poultices, dionin, and massage of the cornea with yellow mercury oxide—are not these provocative measures? Hence the operation alone is new, whereas the medical therapy has always had the same objective; namely, to increase all the defensive mechanism of the corneal membrane.

Perirrhaphy is recommended in the therapy of trachomatous corneal pannus, corneal ulcers, kerato-hypopyon, corneal opacities, and parenchymatous keratitis.

Via Vittorio Emanuele, 460.

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INHIBITIONS OF THE AUTONOMIC NERVOUS SYSTEM BY EYE STRESS*

E. L. JONES, M.D.

Cumberland, Maryland

A freight train on a Southern railroad was held up by a beetle which got between the contact points in the block system. The autonomic nervous system consists of the sympathetic nervous system and its ganglionic plexuses, plus the pneumogastric and some other branches from the cerebrospinal system. From these go fibers to all vital organs. To function freely, the neural currents or impulses that activate the vital machinery must have unobstructed transmission.

Varied disorders of the human system have their origin in disturbances of the autonomic nervous system, originating in eye stress. The ciliary muscle, concerned in focusing the eye, is a station in this important system. Stressed vision brings on such disorders as are to be here considered. We may see in illiterates as violent upsets as in professional scholars or university graduates. While most of these patients have ocular discomfort, the general somatic symptoms occur as often when there is neither deficiency nor discomfort in vision. In a practice in one community the same patients have been under observation for many years, with opportunity to observe in some families similar manifestations in the offspring. Likewise it shows instances of those who, in early life, rejected relief for their eyes, to spend years in a futile effort to find health by medicine, surgery, and "pathies"—only to be cured in later life by the help they had formerly refused.

Seventy years ago some Philadelphia doctors began to report the cure of headaches and other nervous symptoms by re-

lief of "eye-strain" (eye stress is to be preferred). Later Dr. George M. Gould published five volumes of *Biographic Clinics*, showing how famous students, writers, and musicians, had gone through life suffering from such symptoms without relief. Many think glasses that give sharp vision are all that is needed. But with perfect vision there may be eye stress. Complex instruments and quick work may get results close to the accurate correction; but inexact correction giving sharp vision, without removing the eye stress, makes the patient worse. As Lord Horder has said, "When the machine is larger than the man, the patient suffers."

It has been claimed that with a high spherical error low astigmatism need not be corrected, because looking through a strong lens obliquely will cause, or correct, an astigmatic defect; that, "weak cylinders are seldom of much use when combined with high spheres." They may be of no importance in securing acuity of vision, but are of all importance in securing relief of somatic symptoms. People who are subject to these reflexes give proof of the importance of exact corrections. Theoretical proofs that things "cannot be" must give way to material evidence that they are.

CASES

Case 1. Dr. S., aged 48 years, came on August 11, 1932, for discomfort in the use of his eyes. He had worn glasses for over 30 years. His heart action was irregular; as a medical student he had been told by his professor that he had a weak heart and would always have to live carefully. He was rejected for life insurance

* Abstract of a paper read before American Association for the Advancement of Science, Section on Medical Sciences, December, 1937.

for the same reason. He easily became tired and winded. He was also timid and unassertive, nervous, depressed, subject to insomnia, with much dreaming. He would wake startled, with rapid breathing. One eye was amblyopic; the other had a large sphero-cylindric error, with the cylinder axis at 90 degrees. The proper angle was found to be 105 degrees, but no sharpening of sight was made in that eye. In October he reported relief from local and head symptoms, and betterment in other ways; heart regular. A year later he had a new air of assertiveness and self reliance. His wife said he was a transformed man. He had ceased to have fainting spells, which had been frequent for years. Examination in August, 1935, showed that he held all gains, and had added a good many pounds to weight. In April, 1937, he was still free from all old symptoms; lived absolutely unrestricted as to what might concern his heart.

Others, who habitually had taken tablets, or digitalis, found themselves able to dispense with these, and return to normal life. Some attributed their former disabilities to overweight. A woman of giantess proportions, with many stereotyped symptoms, wrote: "I know I am no lighter on the scales, but I am very much lighter on my feet."

Case 2. G. W., an athletically built boy of 13 years, was referred by his physician because of eye discomforts, headaches, and sick headaches. He was nervous, easily became tired and winded, had gassing stomach, with chest pains, and a pulse of 110. After exact correction, under cycloplegia, of errors that did not impair vision, he rapidly threw off all his symptoms. After several years he returned because of recurrence of fatigue, dizziness, indigestion, poor sleep, and loss of weight. Changes of refraction that had taken place were corrected, and he soon picked up in feelings and performance. Six months

later his mother reported: "He is a transformed person. Has gained 15 pounds; from being gloomy became lively. Works hard and pulse is regular at 75." In March, 1937, he returned with the same symptoms as before: apathy, shortness of breath, rapid pulse, loss of weight, excessive perspiration. Slight changes in strength and cylinder axis were made, and 10 weeks later he wrote: "If it were not for optics, I am sure our family would be a sorry bunch."

Case 3. J. W., brother of the patient described in case 2, aged 18 years, delicate build, came for eye symptoms, headaches, and neck and shoulder pain. He was dizzy, depressed, became easily tired and winded. After a proper refractive correction he was well for over two years. Then, following a throat infection and long hours of clerical work, the old symptoms returned. A slight change in his cylinders made no change in his vision, but after five weeks he wrote: "Since I received the new glasses I have improved greatly, both physically and mentally and have gained $7\frac{1}{2}$ pounds. Our family has an epidemic of eye trouble, and we all realize that without our glasses we would be physical wrecks."

Disturbances of the gastro-hepatic system, by interference with their autonomic nerve regulation, constitute a large segment of human ills, both somatic and psychic. A syndicated description of functional heart disorders ends with patients waking up with rapid breathing and heart action, and fear of impending death; then, in some cases, sending for the doctor in haste; in others, sending for all the doctors in haste. Numbers of them scream or cry in sleep, awakening not only roommates but the entire household. A middle-aged woman recently said that when staying away from home she warned her hosts not to pay any attention to shrieks coming from her by which they

might be awakened. It is common to find the appendix and gall bladder have been removed, not only failing to cure, but making the symptoms worse. It is established that where eye stress is disturbing the autonomic nervous system, any surgical, traumatic, medical, or emotional stress will aggravate the symptoms. The frequency with which certain surgical diseases can be mimicked by eye stress, especially as regards the liver and gall bladder, is remarkable. The concurrent symptoms which cannot be explained as due to liver or gall bladder, are clearly explained by a perverted autonomic nervous system.

Case 4. Mr. B., aged 57 years, came in November, 1935, for common local eye complaints. His appendix had been removed 20 years before. He had the following symptoms: Neck and shoulder pain going over ears to forehead. He was depressed, apprehensive, and easily became tired and winded. He had had bad gassing of the stomach for 20 years, with palpitation, often preventing sleep entirely. He would waken startled, sometimes sitting upright, with rapid breathing, and afraid to go back to sleep; talked in his sleep, occasionally screamed, and his feet and ankles were cold. Most of the symptoms for which he had his appendix removed continued to recur. He was wearing bifocals, which gave perfect vision for distance and near. Careful tests showed a very small difference in angles and strength of weak cylinders, but gave no sharper sight. After 18 months an acquaintance who knew him well said: "He is greatly improved in health and looks." In September, 1937, he was in better health than for 15 years, had gained over 10 pounds in weight and acquired a ruddy color, entirely changing his looks.

Case 5. Miss H., aged 58 years, stenographer, a resolute, well-poised woman, in perfect health, began early in April,

1935, to run down in health. Given a furlough she went to her distant home in another state. Much of her time was spent resting in bed, under medical supervision. Her weight fell from 180 to 150 pounds. Her pulse was very rapid, with nervousness and weakness in proportion. Being compelled to resume work, she came to get better glasses in October. Her eyes were prominent and staring. She was weak to exhaustion, pulse 125, sometimes regular, sometimes intermittent. She had tremor of the hands and suffered from drenching sweats. A young physician who had seen much thyroid surgery, agreed that by accepted standards it was a case for such surgery, so serious as to demand a two-stage operation. She was wearing minus spherical bifocals which gave good vision far and near. Under careful testing a small astigmatism was found, with the large spherical errors. The correction was of no consequence to vision, but within a month she began to look and feel better, and in three months her improvement was evident to all her acquaintances. At the end of a year the pulse continued slightly fast, but regular, and nothing was left of the thyroid explosion, except a memory. A half year later the pulse was normal in rate.

Cold feet, or cold and sweaty feet, are common from autonomic imbalance, and one of the last symptoms to disappear. A widow coming back many years for reexamination, when asked about her former symptoms laughed and said: "Well, I know I got rid of those icy, icy cold feet."

Case 6. Another widow, with children out of proportion to her resources, had large astigmatic, myopic errors, corrected by glasses. She easily became tired, had many headaches, severe dizziness, car sickness with vomiting, gassing stomach, icy feet, and a bad heart for which she was under treatment by a physician. A

new correction put things right again for several years. The one notation after 15 years from the beginning is: "Past year gradual return of most local and general symptoms, except cold feet." Recorrection made her comfortable again.

Case 7. Mr. H., aged 45 years, strong and robust looking, was too weak and easily exhausted to work at any job. In spite of his having strong spherical lenses fitted by an oculist, he had been unable to do any night reading for five years, and suffered almost constant headache and nausea. He would waken startled, with rapid breathing, much dreaming; talked in his sleep, sometimes screamed. He had an inward nervousness; hands and feet and arm-pits sweat in the coldest weather. A very small astigmatism in one eye and moderately small in the other were found with strong sphericals. In a few months he regained his health, went back to work, and supported his family.

Case 8. Mrs. T., aged 24 years, came for local discomforts, and among her general symptoms sick headaches, dizziness, hands and feet always wet. She was wearing weak, plus spherical lenses. A small astigmatism was found in one eye and a trifle more in the other. Wearing of her correction caused all her symptoms to vanish for 11 years; then old symptoms returned, with a neck pain going over ear to forehead, sweating over the body, worse in arm-pits, groins, and flexures of knees. A slight shift in the axis of the cylinders gave her total relief of all symptoms, including the sweating. This was her condition after 16 months. A case reported by Braeucker is cited, in which the

secretion of the sweat glands could be arrested in the region affected by injection of novocaine in the brachial plexus. While making no claims as to treatment of epilepsy, it has fallen to the writer to have several confirmed epileptics get and remain well for years of typical epileptic attacks which had been frequent before.

Case 9. Mrs. F., aged 43 years, did not wear her eye correction, fitted 20 years before, because she thought a mistake had been made in them. She suffered severe headaches, dizziness, constant fatigue, depression of spirits, cold hands and feet. After many surgical experiences, including removal of the appendix, one ovary, uterus, gall bladder, and at intervals teeth, the sources of eye stress were patiently sought and corrected. At the end of two months an improvement in looks was evident to her family and friends. Seen after seven months, she "looks better and younger," and a few weeks later, "bubbling over with buoyant health."

The layman can only conceive of glasses as something to make vision clear, not as something to influence bodily function for the better, even though for a time obscuring rather than clearing things viewed. Putting the idea across with the patient that his body is being treated, and that judgment is to be based on results obtained, and not upon how clearly he sees at a distance, is well nigh impossible, unless the physician aids the ophthalmologist in making the patient persist in the use of glasses that do not meet his conception of what things should be.

7 South George Street.

OCULOGLANDULAR DISEASES WITH SPECIAL REFERENCE TO TULAREMIA AND PARINAUD'S CONJUNCTIVITIS*

V. REEVES HURST, M.D.

Longview, Texas

In the last eight years I have had the opportunity to see 23 cases of oculoglandular disease in my practice, and it has been suggested to me that a brief description of the series would have interest, especially since in several of the cases colleagues whose ability in these lines is well known have generously helped out my own deficiencies of experience and resources for pathologic and bacteriologic study. Nineteen of these cases were briefly reviewed in a previous report.¹

In all of the cases of my series there was a more or less generalized conjunctivitis and a vegetative growth springing from the conjunctiva combined with swelling of one or more of the regional lymphatic glands. This association of symptoms was first definitely called to the attention of the medical world by Parinaud in a description of three cases, published in 1889, and has since gone by his name, as Parinaud's conjunctivitis. The oculoglandular syndrome is now regarded as unusual but not extremely rare. My own experience leads me to believe that it is of more common occurrence than the literature on the subject would lead one to suppose. It is usually a mild disease with spontaneous, though delayed, healing and no sequelae, and it seems probable that many cases run their course without ever having been recognized as such. Other than removal of the large vegetative growths, treatment does not seem to alter the course of the disease.

The clinical picture described by Parinaud is clear-cut and it is remarkable that in half a century little has been added to it nor has it been otherwise altered. For a description in words one can-

not do better than to turn to Parinaud himself. Somewhat shortened, his description is as follows:² "The conjunctiva is the seat of red or yellow vegetations, semitransparent at the beginning, opaque at a later stage, which can reach the size of a large pinhead. Alongside of these fleshy granulations, one finds very minute ones, entirely yellow. The cornea does not appear to have any tendency to be involved. There is a mucous secretion. The lids are swollen, firm to the touch. The parotid region becomes very rapidly the seat of an inflammatory swelling which can extend to the neck and in the midst of which one discovers swollen and sometimes softened glands. There is fever with irregular chills; it can persist for a long time, but always remains moderate and does not gravely react upon the general state."

Very rarely the condition is bilateral. Hoor³ reported two such cases. My series contains one. From the history given in my case it does not appear that there was any noticeable interval between the development of the conjunctivitis in one eye and its appearance in the other. The preauricular gland was enlarged on each side.

In general, the glandular swelling is more or less simultaneous with the occurrence of the conjunctivitis. In one of my cases, however, the enlargement of the glands appeared more than two weeks after the first ocular symptoms were noticed, and in another case the glandular swelling was present six weeks or longer before the eye became reddened. The glands are often tender, distinctly painful, and they sometimes suppurate.

Constitutional symptoms were absent

*Presented before the American Academy of Ophthalmology and Otolaryngology, at Washington, D.C., in October, 1938.

or slight in the great majority of cases in my series. Onset was mild, and the symptoms developed gradually. Two cases, on the other hand, are singled out by a clinical course that was strikingly different from that of all the others. Onset was rapid, with severe constitutional symptoms and very high temperature, reaching 106°F. in one case and 105.6°F. in the other. These two cases, furthermore, were the only ones of the series in which the lesion of the eye ulcerated. More will be said about these two cases when I come to speak of etiology.

Interest in the oculoglandular syndrome centers today in the problems of etiology. Parinaud made no pathologic nor bacteriologic studies. He pointed out that the cases which he was reporting gave the clinical impression of an infectious disease, and he suggested that the disease might be contracted from animals.

That the disease was a manifestation of tuberculosis was early suggested. In a few cases the tubercle bacillus has been demonstrated in material from patients' lesions, and animal inoculation with such material has produced lesions similar to those of tuberculosis. Von Szily⁴ recently demonstrated tuberculosis after painstaking study in a case that was, clinically, a typical Parinaud's conjunctivitis. He believes that the infection was of the bovine variety. Nichelatti⁵ thinks that Parinaud's conjunctivitis results from tuberculous re-infection of an allergic individual, which would explain the difficulty in finding the bacilli in the lesions and the spontaneous healing.

On the other hand, it has been shown that the oculoglandular syndrome can be caused by *Bacterium tularensis*, by either of two organisms which are probably related to this bacterium—*Bacillus pseudotuberculosis rodentium* and an organism named by Pascheff,⁶ its discoverer, *Micrococcus bacillus polymorphicus ne-*

croticans—and by the leptothrix, first isolated from cases of the oculoglandular syndrome by Verhoeff, and since found in large series of cases by Sanford Gifford and others.

Analyzing my 23 cases from the standpoint of etiology, I am able to state that in 2 cases the patients' blood agglutinated with *Bacterium tularensis*, in 4 cases the leptothrix was discovered, but in the remaining 17 cases no causative organism was demonstrated in spite of the fact that in 4 of these, biopsies were made of the conjunctival tissue, and several of our leading eye pathologists gave me their invaluable aid in the search. In 4 of these 17 cases of undetermined etiology, the agglutination test for tularemia was made and was found to be negative.

Tularemia has recently excited much interest among ophthalmologists both in this country, where it is better known, and abroad, where tularemia in any form has made a recognized appearance only within the last few years. The first case of tularemia in man, which was diagnosed and proved by laboratory methods, was, as related by Vail,⁷ a case of tularemia of the conjunctiva. According to Francis,⁸ of the United States Public Health Service, 8,137 cases of human tularemia had been reported in this country up to and including 1937. Cases have been reported from every state of the Union, except Vermont and Connecticut, and from the District of Columbia.

The conjunctiva was the primary seat of the infection in 68 or about 1-percent of the 6,274 cases of tularemia reported in this country up to 1936. Francis⁸ states that the infection was transferred to the eye by the hands, while dressing rabbits in 52 of the 68 cases.

Certain European authors⁹ are today pressing the viewpoint that Parinaud's conjunctivitis and oculoglandular tularemia are one and the same disease.

This view challenges special attention in America, where tularemia in its various forms is so much more prevalent than anywhere else in the world and Parinaud's conjunctivitis is seen at least as frequently as elsewhere. My own experience, which has allowed me to obtain first-hand impressions from two cases of proved oculoglandular tularemia during the time that I was seeing a comparatively large number of cases that were typical of the disease described by Parinaud, leads me to the conviction that oculoglandular tularemia should be separated entirely from Parinaud's conjunctivitis. To make my reasons for this opinion clear, I shall describe in some detail the clinical picture of my two cases of proved oculoglandular tularemia.

CASE HISTORIES OF OCULOGLANDULAR TULAREMIA

Case 1. P. T., a white boy, aged 12 years, entered the hospital January 25, 1930, because of pain, swelling, and redness of the left eye, and tenderness with swelling of the left side of the neck of two days' duration, high fever (temperature up to 106°F.) and general malaise.

The patient attributed the swollen eye to a blow from the elbow of another boy, received about eight days previously.

Physical findings: The patient appeared acutely ill, with a temperature of 104°F. The preauricular, cervical, and submaxillary glands on the left side were enlarged and extremely hard and tender. The throat was generally red, with several small white patches.

Ocular findings: Vision seemed to be approximately normal, but the patient

was too ill to permit of accurate testing. The right eye appeared to be normal. The lids of the left eye were markedly swollen and reddened. On the congested palpebral conjunctiva were many small yellowish ulcers. The other structures of the eye appeared to be normal.

Diagnosis: A tentative diagnosis of



Fig. 1 (Hurst). Lymphadenopathy, seven weeks after primary infection, in case of ocular tularemia.

Parinaud's conjunctivitis was made, but in view of the high fever and the seriously ill condition of the patient later in the day, the possibility of tularemia was considered, and questioning brought out the fact that the boy had killed and skinned two wild rabbits one week before the onset of symptoms. Blood taken five days after the patient entered the hospital was reported by Dr. Edward Francis, of the United States Public

Health Service, as having positive agglutination for *Bacterium tularensis* in dilutions of 1:28. Blood taken 10 days later showed positive agglutination for *Bacterium tularensis* in dilutions of 1:5120.

Clinical course: The patient continued

sultation September 4, 1937. He had been injured in the right eye one week previously by being struck by the branch of a tree. Three days after the injury fever appeared, and the temperature rose to 104°F. The injured eye was reddened, swollen, and painful; there were pain in

TABLE 1
SYNOPSIS OF TWENTY-THREE CASES OF OCULOGLANDULAR DISEASE

Case No.	Age	Sex	Race	Temp.	Glands	Etiology	Remarks
1	12	M	W	106.0	Preaur. submax.	Tularemia	Positive agglutination. All glands suppurated.
2	6	F	W	98.4	Preaur. cerv.	Unknown	
3	35	F	W	100.0	Preauricular	Unknown	
4	14	M	W	101.0	Preaur. bilat.	Unknown	Verhoeff reports not typical of Parinaud's appearance of rhinoscleroma. Unable to make a diagnosis.
5	23	F	W	101.4	Preaur. cerv. submax.	Unknown	
6	20	F	W	98.4	Preauricular	Unknown	
7	20	F	W	98.0	Preauricular	Unknown	Friedenwald reports unable to make a diagnosis. Does not appear to be T.B.C. or Parinaud's.
8	5	M	W	101.0	Preauricular	Unknown	
9	7	M	W	98.4	Submax. cerv.	Unknown	
10	24	M	W	99.0	Preaur. cerv.	Unknown	
11	13	F	W	100.5	Preaur. bilat.	Unknown	Both eyes involved.
12	15	M	C	99.2	Preaur. cerv.	Unknown	Preauricular glands suppurated and drained several weeks. Cultures from discharge, negative.
13	5	M	W	98.4	Submax.	Unknown	
14	10	M	W	100.0	Preauricular	Unknown	Blood count showed no eosinophiles.
15	60	F	W	99.0	Preaur. submax.	Unknown	
16	29	M	C	98.2	Preauricular	Unknown	Friedenwald reports not Parinaud's. Col. Ash suspects it was. Eos. 3%.
17	26	F	W	100.0	Preauricular	Unknown	
18	33	M	W	98.0	Preauricular	Unknown	
19	9	F	W	99.6	Preauricular	Leptothrix	Leptothrix found by Dr. Lamb. Eos. 3%.
20	21	M	C	105.6	Preaur. submax.	Tularemia	Agglutination positive. No suppuration of glands.
21	8	F	W	98.0	Preauricular	Leptothrix	Leptothrix found by Dr. Gifford. Eos. 9%.
22	7	F	W	104.0	Preauricular	Leptothrix	Leptothrix found by Dr. Gifford. Eos. 4%.
23	6	M	W	100.2	Preauricular	Leptothrix	Leptothrix found by Dr. Verhoeff. Eos. 8%.

to have fever up to 104°F. for 30 days. Most of the glands on the left side of the face began suppurating after about one month and discharged for several weeks. The conjunctiva returned to normal at the end of six weeks.

Case 20 (see table 1). B. M., a Negro male, aged 21 years, was first seen in con-

the head and shoulders, sore throat, and general malaise. The patient had been confined to the hospital, where a thorough general examination had revealed no cause for the fever other than what appeared to be a mild tonsillitis.

Ocular findings: Examination of the right eye showed a deep corneal abrasion

in the pupillary area, with some swelling of the lids and more than usual injection of the palpebral and bulbar conjunctivae. There was very little secretion in the conjunctival sac. The right eye was otherwise normal. The left eye appeared entirely normal. Since the patient was acutely ill, his vision was not tested.

Diagnosis: A clinical diagnosis of tonsillitis and traumatic injury to the left eye was made at this time. The diagnosis of tularemia was not entertained until 14 days later. The patient's blood was then tested for agglutination with *Bacterium tularense* and was found positive in dilutions of 1:640.

Clinical course: After the time of my first examination, the patient continued to run a very high fever, and in about seven days the right preauricular and submaxillary glands enlarged. Fourteen days after the first consultation, he was seen again by me. He had been seriously ill, with temperature up to 105.6°F., and no diagnosis had been made, though he had been observed carefully by his physicians and had had thorough laboratory checks. Examination of the right eye now showed typical lesions of tularemia of the palpebral conjunctiva, with nodular ulcerations having yellowish centers, the picture so vividly described by Dr. D. T. Vail, Sr.¹⁰ as looking "like yellow polka dots in a piece of turkey red calico." The corneal wound had not healed, as would have been expected, but remained as an excavated ulcer. The preauricular and submaxillary glands were greatly swollen and very tender. At this time the diagnosis of tularemia was established by an agglutination test. The patient continued

to run a high fever for six weeks after the onset of the disease. The lymphatic glands did not suppurate. When the patient was last seen, four months after onset of the disease, the conjunctiva had returned to normal, but a large scar was present in the cornea, which reduced the vision to light projection.

The occurrence of trauma to the eye about the time of the contraction of the



Fig. 2 (Hurst). Conjunctival granuloma with preauricular adenopathy.

infection in both my cases of tularemia may be worthy of note. Francis⁸ states that since the organism will penetrate normal skin, a wound of entry is not necessary for infection, but that in the majority of human cases a wound of entry has been inflicted at the site of cutaneous infection either at the time of infection or shortly after or before.

For comparison with these cases of proved oculoglandular tularemia, I will describe more briefly the clinical features

of a case in which Dr. Sanford Gifford demonstrated the leptothrix in sections of the conjunctival vegetation.

CASE HISTORY OF LEPTOTHRICOSIS

Case 21. P. N., a white girl, aged 8 years, first noticed a swelling in front of the left ear one week prior to entering the hospital. The swelling was hard and slightly tender. Two days before admission the left eye was swollen. There were no other symptoms on admission. Ex-



Fig. 3 (Hurst). Conjunctival granuloma with preauricular adenopathy.

amination showed a hard, nontender, fixed, left preauricular gland measuring about 3 by 3 by 3 mm. The upper lid of the left eye was diffusely reddened, there were numerous follicles, and a polypoid vegetation, measuring 1 by 2 by 3 mm., springing from the center of the upper fornix. The temperature was 98°F., rising to 101°F. later that day. During the following six days the temperature oscillated between 97° and 100°F. Recovery was complete in three weeks.

The following case is described as an example of a case of the oculoglandular syndrome with unknown etiology. The histologic sections were examined by Verhoeff and failed to disclose the leptothrix or to provide the basis for any other etiologic diagnosis.

CASE HISTORY OF OCULOGLANDULAR SYNDROME OF UNKNOWN ETIOLOGY

Case 4. C. E. S., a white boy, aged 14 years, had noticed swelling of the lids of the right eye and roughness in this eye for two weeks, but there had been little discomfort, and the condition had not interfered greatly with his school work. Examination showed much swelling of the lids of the right eye and on the upper palpebral conjunctiva a growth, the size of a pea, surrounded by enlarged follicles. During the next few days the preauricular and anterior cervical lymph nodes enlarged and became sensitive to pressure. The temperature was 101°F. The blood agglutination test for tularemia was negative. At the end of six weeks the temperature had returned to normal and the conjunctival lesion and adenitis had subsided.

No clinical differences are apparent between those cases of oculoglandular disease in which the leptothrix appears as the etiologic agent and those cases in which diligent search has failed to disclose the etiology. Nevertheless, I feel that progress will be faster in arriving at the true nature of disease presenting the oculoglandular syndrome if we hold steadily to an etiologic classification in so far as we can assure ourselves of the etiology in the individual case. Where the tubercle bacillus has been shown to be

the etiologic agent, I would term the disease tuberculosis; where the patient's blood agglutinates with *Bacterium tularense*, I would call it tularemia. Where Verhoeff's leptothrix is found, the logical thing would seem to be to call the disease leptothricosis. It may well be that the future will show the leptothrix in an ever increasing number of cases of typical Parinaud's conjunctivitis, so that we shall be justified in reserving the latter designation exclusively for cases of this etiology. Those cases in which no etiologic agent can be discovered I would place in a group by themselves, as cases of the oculoglandular syndrome of unknown cause. That there is an organism, or organisms, as yet unsuspected, capable of producing the oculoglandular syndrome with a clinical picture that is typical of Parinaud's conjunctivitis, seems, in consideration of my series of cases, to be strongly probable.

SUMMARY

In 23 cases of oculoglandular disease, with histologic studies on 12, no clinical difference was noted between cases in which the leptothrix was found and cases in which it could not be demonstrated. Two cases of

oculoglandular tularemia were sharply differentiated from the cases of Parinaud's conjunctivitis by their clinical course and agglutination reaction, which bears out the contention that these are separate disease entities.

I should like to express my appreciation to Dr. F. H. Verhoeff, Dr. Sanford Gifford, Dr. Harvey Lamb of Washington University, Dr. Percy Friedenwald of Johns Hopkins, Colonel Ash of the Army Medical Museum, Dr. J. L. Go-



Fig. 4 (Hurst). Lesion on lid in which the leptothrix was found.

forth, and the Department of Pathology of Baylor University for the bacteriologic and the pathologic study of these cases.

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DISCUSSION

DR. SANFORD R. GIFFORD, Chicago: Dr. Hurst has had a remarkable experience in being able to see and diagnose 21 cases of Parinaud's conjunctivitis and two of oculoglandular tularemia. Only one other man, Dr. Verhoeff, has had a greater experience with the disease, and of the 45 cases from which he examined material I do not know how many he saw personally. It is remarkable that such a profusion of cases should have been seen in two localities so distant geographically and in every other way, as Boston and Longview, Texas. The only conclusion to be drawn from this is that the condition is more common than is usually believed over a widespread area, and that groups of reported cases accumulate in localities that possess an ophthalmologist interested in the condition. About eight years ago I saw one of Dr. Hurst's cases while at a meeting in Dallas and could confirm his diagnosis of Parinaud's conjunctivitis. I examined material from this case and found what I considered elements of leptothrix in sections. They were few in number, however, and Dr. Verhoeff did not agree with my identification. In material from another case that he saw not long after this, I was unable to find threads of other organisms. In two other cases from which he sent me material this summer, however, many undoubted leptothrix threads were present, in the capillary spaces and free in the tissues. There can be no doubt, therefore, that in these two cases at least he was dealing with leptothricosis conjunctivae.

In 18 of his cases findings were negative. As I understand it, these cases were clinically similar to the ones in which leptothrix was found. Dr. Hurst states that in 12 of these cases tissue was not removed for sections, and it seems more than possible that leptothrix might have

been found in some of these. I would like to emphasize the simplicity with which such material can be taken. Nothing need be said to the patient. Two or three applications of 10-percent cocaine are made to the conjunctiva at the site of a lesion and after waiting three minutes it is removed by one snip of a very sharp iris scissors. In one of Dr. Hurst's cases and in several of mine, where one especially large granulation was present, such removal has seemed to hasten clearing up of the lesions definitely. Dr. Hurst has not mentioned that in some cases the granulations are very small or even absent, but that there are present in all cases small gray areas which Verhoeff has described as points of focal necrosis. These seem to be the essential lesions, and it is in these areas that leptothrix threads are found. In at least one of Dr. Hurst's cases in which I found many leptothrix threads, many giant cells were present, a finding which, I believe, differs from those of Dr. Verhoeff. Aside from the four cases from which I saw only the material, I have seen 10 cases of the condition in Nebraska, Illinois, and Texas. In three of these, the first cases I had seen, sections were negative. In one, permission to remove material was refused. In six cases sections showed the elements of a thread-mold which, in view of the positive cultures of Verhoeff and King, one must be disposed to accept as a variety of leptothrix. In one case the material was from the only lesion present at the time it was removed and portions of a vegetable foreign body were found embedded in the tissue. Hence in this case, it seemed that the primary lesion was removed, and that inoculation had occurred by the embedding of this vegetable particle in the upper cul de sac. These cases have been reported elsewhere, ex-

cept for two seen this year. One of these was in a patient with unilateral adenopathy and one small polypoid mass in the upper fold. Many elements of a thread-mold were found in sections and cultures according to Verhoeff's method made by Dr. Day from the preauricular gland showed a leptothrix. The case will be reported in more detail elsewhere. Cultures from the gland in another case were not made until most of the swelling had disappeared, about six weeks after the onset, and were negative. Since the report of Verhoeff and King, Wright has grown leptothrix from the preauricular gland of a patient.

It is unfortunate that demonstration of the leptothrix in sections and its growth in culture should both be slightly complicated procedures. Cultures require that special media and facilities for partial carbon-dioxide tension be prepared beforehand and demonstration in sections requires removal of one of the essential lesions, its fixation in Zenker's fluid and some experience with Verhoeff's modified gram stain to prevent complete decolorization of the threads. It is undoubtedly these details which have prevented identification of the threads by a larger number of observers.

This has allowed the importance of Verhoeff's discovery to escape the attention of many ophthalmologists, especially in Europe. I became engaged in a mild polemic with Professor Junius of Bonn following his publication in 1932 (*Zeit. f. Augenh.*, 1932, v. 78, p. 142). While he was familiar with the reports of Verhoeff and myself, he apparently believed that most cases of the condition described by Parinaud were really cases of tularemia. This was apparently due to the fact that leptothrix had never been found by a German ophthalmologist. The same point of view was expressed by Pillat and David in 1937, who emphasized the rela-

tive frequency of oculoglandular tularemia. Professor Pillat was finally convinced of the pathogenic importance of leptothrix after Dr. Verhoeff had sent him sections, but it cannot be said that my well-meant intervention accomplished very much towards clearing up confusion as to the name of the disease. It is to be hoped that this remarkable collection of cases by Dr. Hurst will come to the attention of many European colleagues.

It still seems to me confusing and misleading to use the names tularemia and Parinaud's conjunctivitis interchangeably. Tularemia is clinically distinguishable from other diseases by the agglutination test which is always positive in the second or third week and usually by a history of contact with rabbits or squirrels. The systemic symptoms are much more marked than have generally been observed in cases described as Parinaud's conjunctivitis. No fatalities have been reported in the latter condition and systemic symptoms are usually limited to slight fever and malaise for a few days after the onset. Agglutination tests for tularemia were made in three of my cases and in two cases seen by Dr. Dillon which were mentioned in a previous paper. They were negative in all as they were in four of Dr. Hurst's cases. During the time when these cases classed as Parinaud's conjunctivitis were seen, I have seen only one case of oculoglandular tularemia. The patient gave markedly positive agglutination tests, was severely ill, and had butchered wild rabbits. This picture agreed with the marked general symptoms seen in Dr. Hurst's two cases of oculoglandular tularemia and those of most reported cases. I have never seen corneal ulceration in leptothricosis, but it has been reported in cases of tularemia, as in Dr. Hurst's case. This experience gives me a personal impression of the relative frequency of leptothricosis con-

junctivae and tularemia, at least in the middle west of North America. I have seen one case of conjunctival tuberculosis during the same time with positive bacteriologic findings.

The presence of eosinophilia, which was noted in a number of cases of leptothricosis, is not constant enough to be of positive diagnostic value. It was present in about half of my cases in which differential blood counts were made, amounting to 3.5 percent, 10 percent, 4.5 percent, 8.5 percent, and 8 percent in five cases of which records are at hand. Dr. Hurst found it in only half of his cases. Hence it may be considered suggestive but by no means essential to the diagnosis. I believe it has not been reported in tularemia.

It is probable that ophthalmologists will continue to associate the name of Parinaud with the picture of unilateral adenopathy and conjunctival granulations. This is likely to be true in spite of modern refinements that make possible a division of this picture into at least three etiologically distinct entities. Hence the suggestion that I proposed in 1934 still seems a reasonable one, that the general picture be denoted as the *Conjunctivoglandular syndrome of Parinaud* and that modern means be employed to differentiate the three diseases which may, in some cases, somewhat resemble each other. These three conditions are, of

course, leptothricosis conjunctivae, the oculoglandular form of tularemia, and conjunctival tuberculosis. Every case falling in this general syndrome should have an agglutination test for tularemia, examination of excised tissue fixed in Zenker's fluid and stained by Verhoeff's method, examination of excised or curetted material for acid-fast bacilli with guinea pig inoculation when possible, and careful inquiry regarding exposure to wild rabbits or squirrels. Although requiring more preparation, there should be added as exceedingly desirable cultures of aspirated pus on serum agar in containers subjected to 10 percent carbon-dioxide tension.

DR. ALBERT C. SNELL, Rochester, New York: I should like to call attention to Dr. Gifford's remark about taking a piece of tissue without the patient's knowledge. That is absolutely illegal under common law, and practically every other law in the states of the United States. If you get by with it, it is all right, but you lay yourself open to malpractice suits. You are not permitted under the law to remove any tissue from your patient, either dead or alive, without the patient's consent or the consent of those who may have authority over the body.

I thought that might be a warning to some of the members of the society. I think you can always get a specimen if you try hard enough.

NOTES, CASES, INSTRUMENTS

NEOPRONTOSIL IN THE TREATMENT OF RECURRENT TRACHOMATOUS ULCERATIONS OF THE CORNEA

AARON BRAV, M.D.
Philadelphia

Whenever a valuable new drug appears on the market, it is at once tried out on all sorts of conditions for which it was not originally intended. This is but natural, for the real curative agents in medicine are few indeed. So, being confronted with a difficult case, I yielded to the temptation to try the much-heralded drug, prontosil, and sulfanilamide, and used it not by the injection method, but by local instillation into the conjunctival sac. The result was so gratifying that I decided to place it on record as it may be of some aid to some ophthalmic worker placed in the same dilemma.

Due allowance must, however, be made for the fact that in my case I used surgical means six months before applying this new drug. I used the regular 2½-percent solution in full strength dispensed in an ophthalmic bottle with a dropper and I directed my patient to instill one drop in the conjunctival sac three times a day. I presented the case before the Ophthalmologic Society of Philadelphia, feeling definitely that the good result obtained for my patient must be credited to the use of this drug.

Mr. W. M. consulted me on December 20, 1937, and gave the following brief history: He had had severe pain in his eyes, especially the right eye, for several years and had been treated for two years steadily by two physicians without obtaining any relief. The last course of treatment was slitting of the canaliculi and probing of the lacrimal duct.

The patient was in good general condition. The right eye was very painful, the lacrimation and photophobia were marked. The patient was unable to do any work and had to be indoors on account of the photophobia.

Examination revealed a markedly inflamed right eye, with marked conjunctival and ciliary injection; the tarsal conjunctiva was velvety and thickened and showed evidence of cicatrization. The cornea was covered with a fibrous tissue that was red because of the numerous blood vessels that covered the cornea. The corneoscleral margin was highly vascular. The anterior chamber could not be made out, nor could the pupil be seen through this vascular cornea. There were several small ulcerated spots, yellowish in color. The eyeball was soft, and vision was reduced to very poor light projection. The left eye also showed pannus formation at the corneal periphery. The central part of the cornea was hazy, due to corneal infiltration, and vision 6/60.

Diagnosis: Trachomatous recurrent ulcerative keratitis superimposed upon trachomatous pannus.

The left eye was not ulcerated, but the fibrous vascular pannus has already progressed to about 5 mm. into the corneal tissue.

The problem of enucleation presented itself to me, and I frankly discussed it with the patient, for on account of the low tension and poor light projection there was not much to be hoped for as far as visual recovery was concerned. I presented to him the only alternative with a ray of hope, an operation on both eyes, since it appeared that the left eye was taking the same course as had the right eye. A tarsectomy would save the left eye and prevent further advance of the

pannus formation. The operation in the right eye, if successful, might stop the recurrent ulceration. He was satisfied. At the Jewish Hospital, on January 2, 1938, under evipal anesthesia, I removed the upper tarsal plates of both eyes, and performed a grattage on both lower lids.

The left eye made a rapid recovery, and I refracted the patient in June, 1938; with corrected lenses his vision was 5/9 and with presbyopic lenses he could read Jaeger 2. The right eye, however, remained troublesome, and recurrent ulcerations of the cornea, requiring cauterization, made their weekly appearance. I used carbolic acid and trichloroacetic acid as cauterizing agents, and employed every drug known for instillation in his eyes, but apparently could not stop the recurrent ulcerations; the conjunctiva, however, was smooth.

The patient had not much pain, but considerable lacrimation and a very annoying burning sensation.

On August 2, 1938, I decided as a last resort to try prontosil and sulfanilamide. I used the prontosil, 2½-percent solution, instilling one drop in the right eye three times a day. Sulfanilamide 5-grain tablets three times a day. He could not take the drug internally and it had to be discontinued after three doses had been given. Five days later, following this treatment, he returned free from pain and the eye began to improve. No further ulceration appeared and in three weeks the photophobia had entirely disappeared; there was no more burning sensation, and the patient felt comfortable for the first time in three years.

The conjunctival redness began to disappear. The cornea became more clear and the vessels showed signs of disappearance.

Vision, however, in the right eye was only good light projection; no objects

could be recognized. The cornea became semitransparent, so that the anterior chamber could be explored. In the pupil, a plastic exudation could be noticed. Tension was still -1. From this date, however, September 1, 1938, the patient began to walk about without dark glasses, and was perfectly comfortable and happy.

Numerous trachomatous cases have been reported in which sulfanilamide treatment gave good results. This, I believe, however, is the first case reported in which prontosil was used by local instillation. The result was so good that I think it should be given a trial in all recurrent ulcerations of the cornea and in all infectious ulcerations of the cornea of a protracted nature. The Winthrop Chemical Company was kind enough to answer my quest by stating that "we are aware of no report where prontosil was used locally in eye infections."

In the Journal of the American Medical Association, Dr. Fred Loe has reported the treatment of 140 cases of trachoma with sulfanilamide, but prontosil was not used locally in the conjunctival sac. The drug is of a reddish color, is nonirritating when administered in cases of ocular infections, and can be used freely by instillation.

I have drawn no conclusions from one case, but am presenting this case to ophthalmologists because it is worth while bearing this drug in mind in the treatment of ulcerative corneal infections.

2027 Spruce Street.

REVISED TECHNIQUE FOR BONE IMPLANT

THOMAS D. ALLEN, M.D.
Chicago

Implantation of bone in Tenon's capsule or the muscle cone after removal of

an eye has been at times difficult or the results unsatisfactory for a number of reasons: Because of faulty technique the ball may not be heated sufficiently; or it may be put in too hot; or in inserting it flecks may become detached and stick to the conjunctival or other surfaces where they are unwanted; or the conjunctival sac may not be sterile; or infection from the enucleated eye may be a complication.

Recently I have had to remove a ball because of a severe bacteremia (scarlet fever) which developed three days after I had placed the implant. An osteomyelitis developed and the usual methods of control were unavailing. Some years ago I had to remove a bone implant that I had inserted too hot. It had caused necrosis in the surrounding tissue. The patient was a diabetic and the tissues would not heal. Since that experience I have put them in cold.

The balls are heated in a wire cage over an open (Bunsen) flame till they become red. Insufficient heating is to be condemned because spores may have become implanted. Mistakes are made by those who *reheat* them. Once the organic material has been burned out, the balls become very brittle. Indeed they have always to be handled with care, but more than one heating causes them to become unmanageable. They are not too brittle, if heated only once and kept sterile, to use with the proper inserter. Guist, who popularized them, used a very cumbersome implanter.

Mueller has made a simple device for this purpose. It is like the one used for the Mules glass spheres but has wider and stronger side pieces, and a slot in the end of the plunger through which a muscle hook can be introduced to hold the ball in place while the inserter is removed.

The technique we use at the Illinois

Eye and Ear Infirmary is as follows: After the enucleation stop all hemorrhage. While this is being done, heat the bone ball in a wire cage over a brisk Bunsen burner till it glows a dull red. Allow it to cool. Place it in the inserter. Place chromic catgut purse-string suture through recti and Tenon's capsule. Hold the conjunctiva and Tenon's capsule open

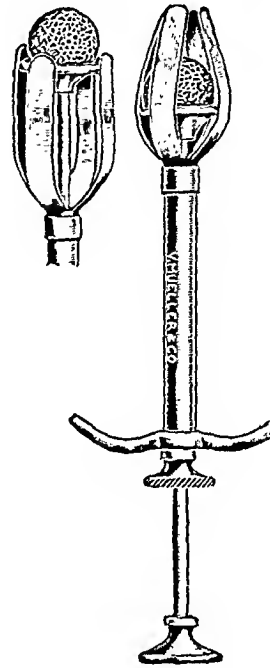


Fig. 1 (Allen). Bone implant inserter.

by four sharp hooks or forceps in the region of the recti muscles, or by a suitable retractor, putting the tissues on somewhat of a stretch. Insert the inserter deeply into the cone and put a small muscle hook through the slot in the plunger to hold the ball in place while the inserter is withdrawn. Examine for flecks of bone. Pull up purse-string suture moderately tight. If necessary take extra sutures in Tenon's capsule to cover the bone entirely. Sew conjunctiva lightly.

122 South Michigan Avenue.

USE OF EMULSIONS IN
OPHTHALMOLOGY*

PARKER HEATH, M.D.
Detroit, Michigan

It is a common observation that the pupillary response to single dosages of drugs in aqueous solution is unequal.

to the unequal absorption of drug from the base and the unequal application and dosage. The corneal obscurity from oil film has disturbed anterior-segment examinations. Some trend toward uniform response follows the use of a drug in buffer solutions, gelatin discs, multiple dosage, oilaceous bases, and after local anesthetic.

TABLE 1
DATA ON EMULSIONS FOR OPHTHALMOLOGICAL USE

Substance	Surface Tension*		pH Value**
	Dynes	at C.	
Distilled water (control)	72.8	24°	6.35
Plain emulsion (no drug content).....	59.9	23°	4.75
Homatropine hydrobromide, 1% em.....	61.1	23°	4.64
Homatropine hydrobromide, 2% em.....	58.3	24°	4.62
Homatropine hydrobromide, 5% em.....	55.1	24°	4.52
Atropine sulphate, 1% emulsion.....	57.8	24°	4.58
Neo-synephrin HCl, 1% emulsion.....	62.1	24°	4.6
Neo-synephrin HCl, 10% emulsion.....	61.8	25°	4.25

* The surface tension was determined by the use of a Cenco Du Nouy Tensiometer.

** The pH values were obtained by the use of a Leeds and Northrup Potentiometer with a quinhydrone electrode.

The viscosity (degree of fluidity) of the plain emulsion is 521 at 100°F. as determined by a Saybolt Universal Viscosimeter; that is, it takes 521 seconds for 60 c.c. of the plain emulsion to pass through the aperture of this apparatus, as, for instance, compared to a heavy mineral oil which runs 364 seconds to pass a 60-c.c. volume.

Similarly, effects on accommodation are unequal. There are a number of explanations. Drugs causing intraocular effects, for the most part, are absorbed through the cornea, and rather uniform response follows the application of equal dosage through this tissue. The variability noted in clinical practice with aqueous solution may be due to the winking out of the solution, irritability from pH, high surface tension, the relatively strong bond between drug and base, the state of the conjunctival secretions, unequal lacrimal drainage and dilution, and other causes. The use of aqueous eye drops results in both irregularity of time of application and dilution of the medicament. Ointments have not proved satisfactory due

Why the emulsion vehicle has not been used in ophthalmology the writer is unable to state. It has been used on other mucous-membrane surfaces. The ophthalmic drug in an emulsion vehicle gives most uniform dosage. In this form the drug acts over a longer time, is more tenacious, does not wink out, and has a low surface tension. The visibility of the drop is high, it is easy to apply, and does not require a trained assistant. The drug is readily mincible with ocular secretions. An emollient effect is produced, since the contact of the emulsion with the eye is natural. The size of dosage is relatively constant. A wider range in pH is possible without irritation, and stability is high. The drops may be made mildly antiseptic and still non-irritating. The use of an emulsion does not interfere with anterior-

* From the Department of Ophthalmology, Wayne University.

segment studies. The more certain dosage saves time and is economical.

The most effective emulsion is the water-in-oil type. This may be due to both physical and chemical factors. The active ingredient placed in aqueous phase gives more rapid and complete action than the active ingredient placed in oil. The preparation should be put through a colloid mill.

The advantages of emulsion drops for office use far outweigh the disadvantages. Some of the latter are: An emulsion is more difficult to prepare, it leaves a residue of crumblike material on the lid borders (not irritating and easily washed off), patients mildly complain of stickiness and the blur. Emulsions require shaking before use. All of these disadvantages are a small price to pay for accuracy.

The use of drugs in emulsions for cycloplegia is particularly satisfying. Precision in dosage is especially important when the synergism of two drugs is employed for quick effect and quick recovery—the method of Beach and McAdams.¹ The writer has adopted Neo-synephrin HCl as a sympathetic drug after animal and clinical tests^{2, 3} had demonstrated its relatively longer, stronger, and more uniform action. He uses the following procedure: homatropine hydrobromide, 5.0-percent emulsion (or atropine sulphate, 1.0-percent emulsion), one instillation; after five to ten

minutes, Neo-synephrin HCl, 1.0-percent emulsion, one instillation; the refraction is done 50 to 60 minutes after the last drop. In children and young adults an extra drop of homatropine hydrobromide, 5.0-percent emulsion, may be instilled after Neo-synephrin HCl, 1.0-percent emulsion. With strabismus patients the home use of cycloplegics may be reinforced by office use of atropine sulphate, 1.0-percent emulsion (or homatropine hydrobromide, 5.0-percent emulsion), and Neo-synephrin HCl, 1.0-percent emulsion; a drop of each spaced 5 to 10 minutes. After refraction has been tested counteracting miotics (eserine 0.2 percent, or pilocarpine 1.0 percent) are instilled once or twice. A single instillation of Neo-synephrin HCl, 1.0-percent emulsion, provides excellent dilatation for fundus examinations. The 10.0-percent Neo-synephrin HCl emulsion is used for the rapid and strong dilatation necessary to break the iris-lens adhesions complicating uveitis with or without secondary glaucoma. This preparation is a strong decongestive of the capillary bed. After a drop of local anesthetic a single instillation usually is sufficient, but occasionally a second is required. The dilatation effect is maintained by atropine or scopolamine. Some caution is indicated in patients with advanced arteriosclerosis or high blood pressure.

1633 David Whitney Building.

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CASE OF BILATERAL OPTIC ATROPHY FOLLOWING INSECT BITE*

J. C. STRONG, JR., M.D.
Chicago

The case presented is one of bilateral optic atrophy. It is at first difficult to understand how an insect bite could cause such damage to the nerves, but after a complete study that did not uncover any other pathology, the conclusion was reached that the insect bite together with the subsequent infection was the causative agent.

Case Report. D. R., a white male, aged 15 years, entered the hospital with the complaint of inability to see light with either eye. He said that he had been stung on June 13, 1938, by some kind of insect, type unknown, on the left side of the face anterior to the ear. He had had a boil on the left side of the face just previous to the insect sting. The boil had healed, however. Two days following the sting the left side of the face and left eyelids began to swell. Five days later the left eye was swollen shut and the entire left side of the face was markedly swollen. He was taken to the Galesberg Cottage Hospital under Dr. C. G. Johnson on the 18th of June. Seven days following the sting he became unconscious and remained so for eight days, according to the patient's parents. On June 20th, the right eyelids became swollen and in two days were completely closed. The entire face became swollen, the swelling extending down to the neck on both sides. The patient complained at times of great pain throughout the head.

On June 21st, the patient was given prontosil. The temperature, which was at

105 degrees, dropped to 102 degrees within the next two days. On June 23d, prontosil was again given in the dosage of 10 c.c. The left side of the face was aspirated, but no pus was found. Hot wet boric-acid dressings were applied to the face. The temperature for the next three days varied between 104 degrees and 102 degrees. On June 26th, under evipal anesthesia, extensive opening was made by Dr. Bower in the left side of the face and drains were inserted. Improvement from this time was progressive.

Eye consultation on July 1, 1938, by Dr. H. E. Eastman, Dr. R. C. Maskney, and Dr. L. R. Mellon: The pupils were greatly dilated, did not react to light, and there was no definite light perception. The patient was unable to rotate the eyeballs. The media were clear, the retina swollen, with many hemorrhages throughout. The nerve heads were greatly swollen. There was a leucocytosis of 12,700, and a faint trace of albumin in the urine.

When the patient entered the Illinois Eye and Ear Infirmary on September 3, 1938, he was in no apparent distress. There was no light perception by either eye, and the pupils did not react to light. The pupils were equal, round, and regular, measuring 7 mm. Tension in the right eye was 14.5 mm. Hg, and in the left, 16 mm. There was edema of the tissue of upper and lower lids of both eyes, most marked in the lower lids. The superficial veins of the lids of the right eye stood out in relief. There was slight paresis of right superior rectus, right inferior rectus, right inferior oblique, and right superior oblique. No other external pathology was noted.

The media of the right eye were clear. The disc was white in color. Nasally, the outline was easily seen; temporally, however, there was blurring. There was an

* From the service of Dr. L. Hoffman at the Illinois Eye and Ear Infirmary, Chicago.

exudate on the surface of the disc, and the vessels were buried in exudate. The arteries were constricted, and there was a white haze along all vessels for a distance of about 2 P.D. The superior and inferior temporal veins were slightly congested. They were the most prominent of all the vessels of the fundus. The macula contained a patch of white exudate. The periphery surrounding the macula had a deposit of numerous white patches, which, extending superiorly and inferiorly about 3 P.D. and to the disc, varied from the size of a pinpoint to that of a pinhead or larger. These exudates were beneath the level of the retinal vessels. Temporal to the disc there was a confluence of these patches into radiating strands closely approximated.

In the left eye the media were clear. The disc, chalk white in color, had a normal outline, with a slight physiological cupping, but the lamina cribrosa could not be seen. The arteries and the veins were normal. No pathology was seen in the macula. There were no scars, exudates, or hemorrhages in the periphery. No pathology was revealed in the anterior chamber.

The physical examination revealed only alopecia areata, and redness of the left ear drum. X-ray study of the skull showed nothing pathological.

The blood Wassermann and Mantoux tests, and the blood chemistry were negative. A spinal test was not made in the Infirmary, but was made at the Billings Hospital in Chicago, and was found to be negative.

904 West Adams Street.

NASO-LACRIMAL DRAINAGE AFTER COMBINED EXTERNAL AND INTRANASAL TEAR-SAC OPERATION

CLYDE E. HARNER, M.D.

Long Beach, California

For some years I have been using a method for keeping patent an intranasal opening from the tear sac which occasionally may have a tendency to close after a combined external and intranasal operation such as the West or Toti-Mosher. So far as I know, this method is original with me, and because of its simplicity and ease of insertion I have been urged by several colleagues to report it.

Several drops of local anesthetic are instilled into the affected eye. After dilating the new drainage canal from tear sac to the interior of the nose with Bowman probes, a strand of stiff number-2, 20-day chromic gut suture is inserted into the lower punctum. It is readily passed into the nose, where it is grasped and pulled to the outside. The two ends are tied together and splinted to the side of the nose with a small strip of adhesive. The patient pulls the loop through the drainage canal a short distance several times a day, thus breaking up adhesions, until healing has occurred and patency of the opening is assured.

I have used this method because: 1. The strand can be inserted in a few seconds without pain to the patient (which is not true of the use of silk or linen thread). 2. It can be changed as often as necessary without inconvenience to patient or doctor. 3. It is well tolerated by the tissues and accomplishes the desired results in this occasional complication.

Security Building.

SOCIETY PROCEEDINGS

Edited by DR. H. ROMMEL HILDRETH

COLLEGE OF PHYSICIANS OF PHILADELPHIA

SECTION ON OPHTHALMOLOGY

October 20, 1938

DR. ALEXANDER G. FEWELL, *chairman*

JAW WINKING: MARCUS GUNN PHENOMENON (REPORT OF A CASE ASSOCIATED WITH CONGENITAL PTOSIS)

DR. CARROLL R. MULLEN read a paper on this subject.

Discussion. Dr. Samuel B. Hadden said that cases such as Dr. Mullen reported are rather uncommon. The first case was described in 1883, and approximately 100 cases have been reported to date. The phenomenon is one that has not, as yet, been adequately explained. As Dr. Mullen's case so clearly showed, on opening the mouth there is a tendency for the upper lid to become elevated with resultant widening of the palpebral fissure. In this particular case this movement occurred on chewing and on rapid enthusiastic talking. At rest the palpebral fissure on the involved side is slightly narrower than on the good side and in many of the cases reported the pupil on the involved side is smaller.

The cases as reported to date may be divided into four groups: 1. Those in whom the upward movement of the eyelid occurs when the mouth is opened or directed to the opposite side. 2. Those in whom the upward movement occurs only on opening the mouth but not on lateral deviation of the jaw. 3. Those in whom elevation of the lid occurs only on lateral movement of the jaw but not with simply opening the mouth. 4. Those in whom the upward movement of the eyelid occurs in

association with movement of the jaw but in whom there is no ptosis.

Various explanations have been offered but when it is recalled that on wide opening of the mouth there is normally an upward movement of the eyelid, it appears that the phenomena is most likely the result of an exaggerated normal associated movement. This explanation is the one most generally accepted but against it is the fact that many times the movement occurs when the jaw is passively opened or moved.

The treatment of the disability is most difficult although Grant recently reported a case in which relief was obtained through a section of the motor supply to the involved pterygoid muscle.

Dr. Francis Heed Adler noticed in the moving picture that there was a definite lack of winking in the left eye of this patient. Was this a constant finding? The theory which best explains the Marcus Gunn phenomenon is, in his opinion, a cortical lesion. The only muscles associated with the eye that have a separate cortical innervation are the levator and orbicularis muscles of the lids. The cortical center for the levator lies very close to the cortical center for the movements of the jaws. This seems much more likely to explain the association of jaw winking by a congenital lesion in this region than to assume a connection between the fibers of the fifth and third nerve farther down in the pathway.

DETACHMENT OF THE RETINA SUCCESSFULLY TREATED BY THE THERMOPHORE (two cases)

DR. H. MAXWELL LANGDON presented the case of F. D. W., a white man, aged 55 years, seen first July 7, 1924, for the

correction of about two diopters of myopia in the right eye and one diopter of myopic astigmatism in the left eye.

He was seen again in 1927 for refraction. In July, 1930, he developed some vitreous floating opacities. At that time his systolic blood pressure was 180. Two teeth showed root infection and were extracted. The vitreous cleared in the right eye but some dots remained in the left eye.

In 1934 he was seen for refraction. On March 29, 1938, he was again seen because of some blurring of vision, which became 5/4 on correction of the refractive error. On May 4, 1938, he found there was a shadow over the left temporal field. Central vision was still 5/5 partly, but the whole temporal field of the right eye was lost from a complete detachment of the nasal portion of the retina, with a large tear up and in. The greatest elevation was seen best with plus 10 D.

On May 6, 1938, an operation was performed; nine thermophore applications at 160 degrees, of one minute each were made. Reattachment occurred, and the patient was discharged on May 27, 1938, with corrected central vision of 5/5 plus and a normal field of vision. The vitreous still shows a few floating dots.

Dr. Langdon next presented the case of W. T. L., aged 55 years, a white man, who was operated on for Dr. Andrew Knox at the Episcopal Hospital, in February, 1936, for detachment of the upper portion of the retina of the right eye. This patient was shown at this Section after the operation with a complete recovery of both central and peripheral vision.

On June 20, 1938, he came to the dispensary of the Presbyterian Hospital complaining of blurred vision in the left eye for two months, the diagnosis of the physician who had examined him being detachment of the lower portion of the retina of the left eye.

The lower half of the retina was elevated about 8 D., the upper portion of the field being lost; central vision was 6/60. No tears were seen in the detachment. On June 27, 1938, his left eye was operated on, eight thermophore applications being made. Recovery of peripheral vision was complete, the field being normal, but the central vision was improved to but 6/9—undoubtedly as the result of the delay of the operation.

So far, Dr. Langdon has operated on 10 eyes by this method. Seven have given perfectly satisfactory results with vision ranging from 5/5 plus to 5/22; this last one being a case which had been detached four months before operation. One other patient enjoyed a perfect result for two months when, in spite of definite advice, he exerted himself violently and suffered a redetachment. His vision, however, has improved from 2/60 to 5/4, and his field from only a small upper portion to a normal outline. One of the others was a man with 10 diopters of myopia, who had a fall sufficient to fracture his lower maxilla. He was not operated on until two months after the accident, the upper half of the retina being detached. The operation replaced the retina but three weeks later, before he was discharged from the hospital, there was a fresh detachment to the temporal side, although the retina at the site of the first operation stayed in place.

Discussion. Dr. James S. Shipman asked Dr. Langdon if he released the retinal fluid before he made his applications with the thermophore. If this is true it is contrary to any of the methods which he had used or had read about.

Certainly, it would seem to him that a wet field would interfere with the application of any type of heat or desiccation, and also with the globe soft or partially collapsed it would be more difficult to apply such an electrode. He is well aware

of the fact that this subretinal fluid must be released in order that the retina may come up against the coagulated points or areas of the choroid, but this can be done easily after the application of heat or diathermy needles has been made.

He believes that Dr. Langdon should not feel badly about a central visual result of 5/9. To him this would appear to be a very excellent result.

In favor of Dr. Langdon's method of using the thermophore for surface coagulation is the fact that the instrument can be used on any electrical current, and with the excellent results which he has obtained it sounds most interesting.

Dr. Langdon said in conclusion, in answer to Dr. Shipman, that this question is rather academic as it makes little difference with this method whether the fluid is permitted to escape before or after the thermophore applications. We do not have to have an eye sufficiently rigid to permit penetration of the sclera if this method is used.

In answer to Dr. Appleton's question, he said he believed that the good results were obtained because sufficient choroidal exudate is produced to weld the retina to the choroid and because great care has been used in the after treatment.

OBJECTIVE SIGNS OF BLINDNESS WITH PARTICULAR REFERENCE TO APPLICANTS FOR PENSION FOR BLINDNESS

DR. ALFRED COWAN said blindness, according to the various acts for granting pensions to the blind, may be defined as partial or complete. The National Society for the Prevention of Blindness considers a person with a vision of 6/60 with the better eye to be practically blind for all ordinary occupations. This is in agreement with the definition of economic blindness prepared by the American Medical Association. Pennsylvania has adopted 10/200 central visual acuity or

less in the better eye with correcting glasses as a definition of economic blindness.

Generally speaking, a central visual acuity of 6/60 or 20/200 is a very liberal interpretation of blindness. This represents a visual efficiency of 20 percent according to the table of Sterling and Snell. This is far from actual blindness, and the examiner might have to remind himself in his observation of the actions of applicants for pensions that a person even with 3/60 vision can recognize, although hazily, all large objects at ordinary distances. In daylight he can see the different colors of the landscape, the outlines of buildings and moving automobiles at a considerable distance, moving people at some distance, even recognize their features at 5 or 10 feet. He can read large headlines in the newspapers. Some people, accustomed to their partial blindness, get around remarkably well and are able to do a surprising number of things.

The prize of a regular monthly dole or pension is sufficient to induce many a person to simulate blindness or to exaggerate an existing partial disability, and experience justifies the statement that every applicant for state aid for blindness is a potential malingerer. Expert skill, knowledge, judgment, and alertness are often necessary for diagnosis when the sight seems low out of all proportion to the objective signs. A person may have sufficiently low vision to be eligible for pension and still have none of the signs of the totally blind person.

Special test cards with the larger letters cut out, doubling the regulation testing distance, poor illumination, and any of the other known stratagems for the detection of malingering should be a part of the equipment of every examiner.

A knowledge of the objective signs of absolute blindness is not often useful for the purpose of diagnosing partial blind-

ness as defined by regulation in the various states. The amount of disability which might be caused by a certain lesion must, therefore, depend on the judgment, experience, and knowledge of the examiner; and if an applicant is intelligent, experienced, or coached, it will be extremely hard to prove that he is a fraud.

BILATERAL ENDOPHTHALMITIS COMPLICATING PNEUMOCOCCIC SEPTICEMIA

DR. JACOB REBER and DR. HAROLD SCHEIE reported a case of a 48-year-old white man who sustained a traumatic infection of the left foot which developed into a generalized septicemia, the first manifestation of which appeared as a bilateral endophthalmitis. Pneumococcus, type IV, was recovered from the blood stream and also from an eye removed at autopsy.

THE USE OF RABBIT ANTIPNEUMOCOCCUS SERUM IN THE TREATMENT OF ULCUS SERPENS

DR. HAROLD G. SCHEIE said rabbit antipneumococcus serum, because of its smaller antibody molecule, higher antibody titer, and availability in increasing numbers of types, as compared with horse serum, might be used to great advantage in the treatment of *ulcus serpens*. One case was reported in an 87-year-old colored man with a favorable outcome.

Discussion. Dr. Leon H. Collins, Jr., said during the past two years there has been an increasing interest in rabbit pneumococcus antiserum both for typing and therapeutic purposes. It is now possible to diagnose the type of pneumococcus infection of the eye much earlier than in the past. A more concentrated serum is now available than formerly and one that usually gives less reaction. The evidence at present available suggests that the antibody molecule of rabbit pneumococcus antiserum is of smaller size than that of

the horse pneumococcus antiserum. Horsfall and his associates have been able to demonstrate type specific rabbit antibodies in the pleural fluid of some patients with pneumococcic empyemas who had received rabbit pneumococcus antiserum intravenously.

The patient presented by Dr. Scheie had received rabbit antiserum both locally and intravenously. It would appear that the treatment here had influenced the course of the disease favorably, but further investigation is necessary to determine the mode of action and the relative value of these two methods of administration in pneumococcic infections of the eye.

Dr. Francis Heed Adler doubted that the antibodies, even in rabbit serum, would get into the normal aqueous when injected into the blood stream. It is quite possible, however, that the small size of the molecule in rabbit serum aids in the penetration into the cornea when the serum is instilled in the conjunctival cul-de-sac. Although the cost of this serum may at first seem prohibitive, it is a very small price to pay for saving an eye, and most manufacturing companies or insurance carriers would be glad to buy it rather than have to pay the compensation for the total loss of an eye.

Dr. Louis Lehrfeld said that 21 years ago, he read a paper before this Section of the College, entitled "Serum therapy as applied to pneumococcic infections of the eye." At that time he was secretary of the Pneumonia Commission of Philadelphia. It was the purpose of this Commission to disseminate information on the prevention of pneumonia and on its treatment by the use of antipneumococcic serum.

At that time there were recognized four types of the pneumococcus. Sera were available for type one and type two. It occurred to him that a mixture of sera of

type one and type two might be of service in the treatment of dendritic keratitis due to the pneumococcus. With the advice of Dr. C. Y. White, Director of the Laboratories of the Health Department, Philadelphia, there were prepared for him ampules containing sera of type one and type two. This mixture of sera was used locally in the eyes of patients having pneumococcal ulcerative keratitis. His report indicates that encouraging results were obtained from its use.

He is gratified to know that great advances have been made in the numerical classification of the various types of pneumococci, since the date of his report, and that sera are now available, depending upon the type of organism present.

Warren S. Reese,
Clerk.

COLORADO OPHTHALMOLOGICAL SOCIETY

October 22, 1938

DR. E. M. MARBOURG, *presiding*

RECURRENT VITREOUS HEMORRHAGES IN YOUNG PEOPLE

DR. FRITZ NELSON presented the following three cases to illustrate intra-ocular hemorrhages in young people.

Case 1. Miss W. C. L., aged 33 years, had been examined at the Dartmouth Eye Clinic in March, 1937, at which time retinal hemorrhages from thrombosis in a branch of the central vein were found in the right eye. There was a moderate degree of anemia and a systolic blood pressure of 210 mm. In May, 1938, the right eye became suddenly blind. Both eyes appeared normal externally. The lower part of the vitreous of the right eye was rendered entirely opaque by blood. A dim fundus reflex was present superiorly. There was a dense mass ad-

jacent to the lens equator inferiorly, apparently very close to the ciliary body. The upper and interior part of this mass was covered with dark-red blood.

The left eye appeared to be entirely normal except for pallor and narrowing of the main retinal arterial branches and increased thickness of their walls. The choroid appeared sclerotic. The vision of the right eye was ability to count fingers at one meter. The vision of the left eye was normal.

General physical examination, including Wassermann and tuberculin tests, was negative except for anemia and a systolic blood pressure of 180 mm. A diagnosis of essential juvenile hypertension was made by the clinician. The patient's father died at the age of 48 years from heart disease and hypertension. Dr. Guy Hopkins stated that there is some evidence to indicate that hypertension of this type is due to obscure endocrine dysfunction.

Case 2. W. R., a white male, aged 35 years, had, in July, 1937, a brief painful attack of inflammation in the right eye. In September, 1937, both eyes became practically blind within one or two days. At that time he was seen by two ophthalmologists in Kentucky who ordered the tonsils to be removed. In April, 1938, diagnosis of ocular tuberculosis was made in Kentucky after a very strongly positive skin reaction had been obtained with one milligram of tuberculin, intracutaneously.

This man was first seen by Dr. Nelson in Colorado Springs, in May, 1938. The general physical examination was negative except for some increased hilus markings and calcification in the chest X-ray film. The right eye was convergent about 10 degrees. There was moderate pericorneal injection. There was a deep and superficial corneal opacity and vascularity inferiorly, representing typical keratitis scleroticans. There were numerous old and fresh (mutton-fat) keratitic precipi-

tates; a gray nodular formation about one-half millimeter in diameter was found in the chamber angle. The aqueous contained many cells. There were newly formed blood vessels in the anterior layer of the iris, and recent and old posterior synechiae and pigment deposits on the lens surface. A circumscribed posterior capsular cataract was present. The vitreous body contained numerous dense floating opacities. A vitreous reflex but no fundus details could be seen. Vision consisted of ability to count fingers at one meter.

The left eye showed a slight amount of pericorneal injection. The cornea was clear. There was a large nodulelike deposit attached to the posterior surface of the cornea, inferiorly. The aqueous contained a moderate number of cells. The iris appeared essentially normal except for numerous delicate posterior synechiae. There was a subcapsular cataract similar to that found in the right eye. The vitreous body was not so cloudy as the right. Several gray strands of connective tissue protruded into the vitreous from the retina. The disc was somewhat pale. There was a large yellow chorioretinitic focus in and around the macula. Wedge-shaped pigmented foci were present in the temporal periphery. Vision consisted of ability to count fingers at one meter. Treatment has consisted of bed rest and scopolamine, dionin, and hot packs used locally. General sun treatments were given several weeks after admission. Tuberculin injections with an initial dose of 1/100,000 mg. were given at weekly intervals after the eyes were completely quiet. When presented to the Society the uveitis was practically healed. The vision of the right eye was 5/25, and of the left eye, 5/35.

Case 3. B. F., a football player, aged 21 years, had a past history essentially negative except that the man had lost 10 pounds during the preceding summer. On

September 12, 1938, the patient was given a routine diagnostic intracutaneous injection of 1/10 mg. of tuberculin at the college infirmary. This resulted in a severe local cutaneous reaction. About 18 days later the patient noticed blurred vision of the left eye. When first seen on October 11, 1938, there was a severe iritis in the left eye with numerous keratitic precipitates, cloudy aqueous, posterior synechiae, and a small, typical tuberculous nodule in the iris. There was generalized retinal edema and slight papilledema. The retinal veins were engorged. No perivascular foci could be seen. Two days later acute iritis with retinal edema developed in the right eye. On October 14th, numerous typical tuberculous periphlebitic foci rapidly developed in the lower parts of both retinae. These foci, resembling bluish-gray balls of cotton, were usually located at bifurcations of the peripheral veins and were always connected with venous branches. Treatment consisted of bed rest and the local application of scopolamine. Tuberculin therapy was considered too dangerous to use.

Dr. Nelson concluded that the most common cause of vitreous hemorrhages in young males is tuberculous periphlebitis. This is frequently associated with uveitis. Syphilis or Buerger's disease must be excluded. Vitreous hemorrhages in young women do not usually indicate tuberculosis. In case 1 the recurrent hemorrhages were apparently caused by the rare *hypertensio arteriarum praecox*. Case 2 represents the usual type of tuberculous uveitis associated with chorioretinitis proliferans. Case 3 is an early example of the same type. The sudden onset seems to have been caused by the diagnostic injection of 1/10 mg. of tuberculin and demonstrated the potential danger in its indiscriminate use. The prognosis in the third case is very favorable. Immediate bed rest is the most important factor in the treatment of highly tuber-

culin-allergic patients. In every case in which sudden blindness associated with vitreous cloudiness occurs in young men, tuberculosis of the retinal vessels should be strongly suspected especially if iris nodules, keratitis scleroticans, and so forth, are present. Tuberculosis tests should always be applied very cautiously. In a highly allergic patient, a dose of 1/10 mg. tuberculin can be very dangerous. In such patients even 1/100,000 mg. can sometimes cause serious reactions. If tuberculosis of the eye is suspected, diagnosis should be verified as quickly as possible. Valuable time should not be wasted in studying focal infection of teeth, tonsils, and so forth. A tuberculous infection of certain lymph glands may also serve as a focus. Such foci are not usually associated with serious pulmonary infection. Physicians do not sufficiently recognize the fact that in tuberculosis of the eye the lungs usually show no gross evidence of tuberculosis.

IRIDOCYCLITIS

DR. V. H. BROBECK presented A. D. H., a white man, aged 34 years. In 1924 a diagnosis of exudative retinitis of the left eye was made. At the time of presentation an old atrophic area bordered by pigment could be seen near the macula. In August, 1938, the vision of the right eye failed rapidly, associated with photophobia and pain. Examination at that time showed mild ciliary injection, moderately large keratitic precipitates, and vitreous opacities. There were fine, clumped, brown-pigment granules on the anterior lens capsule. Intradermal tuberculin tests were positive in high dilutions. The Wassermann reaction was negative. Two injections of typhoid (H) antigen were given followed by paracentesis of the anterior chamber. Also 10 injections of Old Tuberculin beginning with 0.0008 mg. were given. Rapid subsidence of the

acute symptoms followed the use of the typhoid therapy.

CHORIORETINITIS IN PERNICIOUS ANEMIA

DR. V. H. BROBECK presented a case of F. T., a 62-year-old white man. The right eye had had a traumatic cataract for many years. There have been attacks of chorioretinitis in the left eye at intervals since 1925. The patient has been treated for pernicious anemia since 1927. At the time of presentation there was a large patch of choroidal exudate in the left fundus. This was traversed by retinal vessels. The optic nerve had a waxy appearance resembling the pallor of an advanced atrophy. There has been at times a generalized pallor of the entire fundus. Retinal hemorrhages have appeared from time to time over a period of years. These were usually flame-shaped. The hematological picture was characteristic of pernicious anemia.

John C. Long,
Secretary.

WASHINGTON, D.C., OPHTHALMOLOGICAL SOCIETY

November 7, 1938

DR. G. VICTOR SIMPSON, *president*

CHORIORETINITIS POSSIBLY DUE TO BOVINE TUBERCULOSIS

DR. EDWARD J. CUMMINGS presented a case.

Discussion. Dr. Oscar Wilkinson commented upon the case saying that he had seen one similar to this, presumably due to bovine tuberculosis, which had been treated with "Bovine tuberculin" with good results.

MASSIVE EXUDATIVE CHOROIDITIS WITH COMPLICATED CATARACT (AND TRANSITORY SECONDARY GLAUCOMA)

DR. JAMES N. GREEAR presented a case.

Discussion. Dr. Benjamin Rones cited

a similar case which, though all tuberculin tests had been negative, proved to be definitely tuberculous from the evidence of the microscopic section after enucleation. He suggested tuberculin therapy for the present case.

HEALING UVEITIS WITH RETINAL TEAR AND DETACHMENT DURING THE HEALING PROCESS

DR. B. J. GURWIN commented upon the case, stating that the tear and detachment had occurred within the last three or four days when the healing process was well advanced.

ADVANCED TUBERCULOUS IRIDOCYCLITIS AND SCLEROKERATITIS (BILATERAL)

DR. FRANK D. COSTENBADER presented a case.

Discussion. Dr. Benjamin Rones distinguished this condition from a corneal dystrophy and discussed briefly the method of progression of so-called sclerosing keratitis. He further suggested that recent work with the beta rays, using radon bulbs and no ocular shield, had seemed to be somewhat helpful in similar cases.

Dr. L. Philip Cox said that sanatorium treatment with complete rest, such as is indicated in general tuberculosis, would be wise.

Dr. Costenbader, in further discussing the case, said that irradiation with the regular gamma rays of the X ray had not been thought wise by the X-ray therapist and further mentioned that sanatorium treatment was not easily available for this patient even should it be thought wise.

SYPHILITIC PRIMARY OPTIC ATROPHY

DR. JOSEPH EARLE MOORE, of Baltimore, emphasized especially the relative merits of types of treatment and prognosis. 1. Sufficient diagnostic study, espe-

cially including close coöperation between the ophthalmologist and the syphilologist, is extremely important.

2. A great percentage of the primary optic-atrophy cases occurs with tabes dorsalis. Winthrop, of Johns Hopkins University, in attempting experimentally to produce pernicious anemia in swine on a vitamin-B-deficiency diet, succeeded in producing lesions pathologically similar to tabes dorsalis in man.

3. The relatively high incidence of primary optic atrophy in the Negro as opposed to the relatively low incidence of neurosyphilis in the Negro was pointed out.

4. A chart was shown which clearly indicated the length of time between the first visit and the time complete blindness ensued. In six classifications: (a) All patients blind in seven years—all untreated cases. (b) All patients blind in seven years—all obviously inadequately treated cases. (c) Sixty-eight percent of patients blind in nine years even under presumed adequate routine treatment. (d) 50 percent of patients blind in 10 years with Swift-Ellis or similar treatment; the remainder maintained vision indefinitely. (e) Only 15 percent of patients blind in three years when treated with malaria, and the remainder maintained vision indefinitely. (f) Combinations of (c) and (e) or (d) and (e) or (c) and (d) produced results somewhat better than those in classification (e).

5. Tryparsamide is absolutely contraindicated in cases diagnosed as primary syphilitic optic atrophy.

6. Good results in the treatment of primary syphilitic optic atrophy are largely dependent on early diagnosis and adequate treatment of the neurosyphilis.

Frank D. Costenbader,
Secretary-Treasurer.

AMERICAN JOURNAL OF OPHTHALMOLOGY

Published Monthly by the Ophthalmic Publishing Company

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WANTED, AN AMERICAN OPHTHALMOLOGICAL SOCIETY

On the sixth of June of this year, the second day of the regular annual meeting held at Hot Springs, Virginia, the American Ophthalmological Society celebrated its seventy-fifth anniversary.

The commemoration took the form of a banquet which was attended by a large number of the members of the Society and their wives or occasionally others of their families. A distinguished and greatly appreciated guest was Mr. H. M. Traquair, of Edinburgh, Scotland.

In an excellent program the outstanding event was an address by Dr. Harry Friedenwald reviewing, with a wealth of significant detail as to personalities and activities, the history of the Society from its earliest days. Dr. Friedenwald has

since circulated to the members of the Society a reprint of the "Account of the origin and first meeting of the American Ophthalmological Society," by Henry D. Noyes, written in 1875.

It was at Noyes's office in New York City that the first consultative meeting with regard to the need for formation of such a society was held, the others listed as present being Henry B. Sands, Herman Althof, John H. Hinton, F. J. Bumstead, D. B. St. John Roosa, and W. F. Holcomb, all of New York City, and Hasket Derby of Boston. This was on January 9, 1864.

The actual organization of the new Society took place on June 7, 1864, at the New York Eye Infirmary, at the time of the meeting of the American Medical Association, eighteen gentlemen being pres-

ent. Dr. Edward Delafield, one of the general surgeons who formed an important proportion of the early membership of the American Ophthalmological Society, was elected president, and Dr. Noyes secretary.

The American Ophthalmological Society was founded after, but in the same year as, the Heidelberg Ophthalmological Society, later known officially as the *Deutsche Ophthalmologische Gesellschaft*. The Ophthalmological Society of the United Kingdom was not organized until 1880, and the French *Société d'Ophtalmologie* came into existence in 1883.

The American Medical Association, whose Section on Ophthalmology is now one of the most important ophthalmological organizations in the country, had been founded in 1847 "to improve the disgraceful status of medical education in the United States." This was four years before Helmholtz's invention of the ophthalmoscope.

It is amusing to recall that the first journal to carry the name "American Journal of Ophthalmology" was founded by one Julius Homberger, a New York practitioner who was rather generally rated by his colleagues as a quack. His journal expired before the second volume was completed. He advertised extensively, was expelled from the American Medical Association in 1868, and died insane. Hasket Derby humorously attributed to Homberger the foundation of the American Ophthalmological Society, because the original purpose of the first consultative meeting called by Noyes in 1864 was really (according to Derby) "to concert measures for the establishment of a magazine that should be respectable."

In those years the term "specialist" was in rather doubtful repute. At the second meeting of the American Ophthalmo-

logical Society, in 1865, an address by Noyes on the subject of "Specialization in medicine" spoke of the discredit cast on the practice of medicine by "persons claiming almost marvelous abilities, and guilty of most unseemly conduct . . . such as the corn doctors, the bone setters, the electricians, the pimple doctor, the hair restorers, the pill doctors." "This sentiment," Noyes observed, "will no longer continue when special departments of medicine fall in the hands of right minded men."

In 1868 the American Ophthalmological Society adopted the rule that no member of the Society should attach to his name, in any public announcement, the title of oculist or any similar title or should "announce in print that he gave special or exclusive attention to special practice." This rigid rule, it may be remarked, was made before the existence of telephones or telephone directories, and also before the publication of a national medical directory by the American Medical Association. As years went by, the rule came to stand in opposition to the custom of a large proportion of the ethical and honorable ophthalmologists of the United States.

Some of the more progressive members of the Society recognized that the rule went too far, and that it militated against the convenience of physician and patient. It was repeatedly the subject of discussion at the Society's meetings; but its severity was not modified until in 1929 the reference to announcement of special practice was deleted from the constitution.

The membership of the Society in its first five years of existence totalled forty-five, of whom fourteen were general surgeons who devoted themselves especially to the eye. After 1870 or thereabout, no general surgeon was elected to membership, and in 1884 the Society voted that

candidates for membership must have been engaged in the practice of ophthalmic surgery for at least five years.

The American Ophthalmological Society has performed most important services for advancement of the specialty, although its leadership in this respect has steadily diminished during the past quarter of a century. When, in 1915, the American Board of Ophthalmology (then the American Board for Ophthalmic Examinations) was founded, every one of the nine members of the Board was a member of the American Ophthalmological Society, although three of them were elected from the Academy and three from the Section of Ophthalmology of the American Medical Association. By virtue of its name and of its historical position in the profession, the Society has acted for the United States in arrangements for international ophthalmological congresses.

The Society has always extended a most cordial welcome to visiting colleagues, although such a welcome can hardly be expected to count very heavily at meetings held (as is usually the case) in eastern summer resorts remote from the large centers of population.

The Society's programs are usually interesting and stimulating. "From the beginning" (as was written twenty years ago) "its transactions have reflected the interest of American ophthalmologists in the preponderance of short papers offering practical suggestions, or placing on record the chief features of striking cases."

Shortly before the American Ophthalmological Society came into existence the total population of the United States was 31,443,321, of whom an estimated nineteen million or so lived in the Atlantic Coast states. In 1896, the Atlantic Coast states were still represented by something like five sixths of the membership of the

Society, although by that time those states contained less than two fifths of the population of the United States. Twenty years ago it was stated by a member of the Society that two thirds or more of its membership had always resided within two hundred miles of New York City.

It may be supposed that this situation was one of the factors which led to the creation of the Western Ophthalmological, Otological, and Laryngological Society, now and for many years known as the American Academy of Ophthalmology and Otolaryngology. Since the formation of the American Board of Otolaryngology (some nine or ten years after the founding of the American Board of Ophthalmology) practically the only requirement for membership in the Academy has been the possession of a certificate from either the ophthalmologic or the otolaryngologic board. It is not surprising, therefore, that the membership of the Academy, under vigorous and progressive leadership, has grown in proportion to the growth of special practice and to the general development of medical science, amounting today to approximately 2800.

The constitutional limit to the number of members in the American Ophthalmological Society is now 225, and the active membership of the Society at the opening of this year's meeting was 183. It is difficult to escape the conclusion that the contrast between the numbers of members in the two organizations is in large degree a measure of a difference in usefulness which reflects to the disadvantage of the older organization.

In point of fact, the American Ophthalmological Society, a small, relatively exclusive, and predominantly local group, can hardly now be regarded as truly representative of the profession of ophthalmology in the United States.

The Society resolved in 1878 that resi-

dence in Canada was "no disqualification for membership." Today Canada is represented by only five members of the Society (four in Montreal and one in Toronto), although the Dominion has a population of over ten million.

The population of the continental United States is now well over 120 million. The center of population has moved steadily westward and is at present somewhere near the western boundary of Indiana. Of the 183 regular members of the Society at the opening of this year's meeting, 116 reside in the Atlantic Coast states, although those states now have only five twelfths of the total population of the country. The state of Texas (population over six million) has only two members, Indiana (nearly three and a half million) three members, Ohio (toward seven million) six members, and California (six million) seven members.

Let us compare these figures with analogous information for several other civilized countries.

Great Britain has a population of about forty-five million. Its national ophthalmological society, the Ophthalmological Society of the United Kingdom, accepts "all medical practitioners whose qualifications are satisfactory to the Council of the Society." Applications, signed by at least three members, are submitted to the Council, and if approved the applicant is admitted to membership forthwith.

The annual volume of transactions of the Société Française d'Ophthalmologie states no restrictions as to membership but lists a total of 1120 members.

The constitution of the Deutsche Ophthalmologische Gesellschaft (Heidelberg Congress) provides (according to the latest volume of transactions available to the writer—that for 1932) that applicants for membership shall apply to the board of directors through the secretary. There were 760 members in the year 1932.

The annual volume of transactions of the Società Italiana di Oftalmologia for 1927 (latest volume available) showed several kinds of membership, including a corresponding membership without vote in the affairs of the Society; and listed a total membership of 316.

Other national societies might be mentioned, such as those of Belgium and Egypt, each of which has a broad basis of membership. It may be said that nearly every ophthalmological society regarded as national is without numerical limitation of membership, and encourages the admission of all reputable ophthalmologists. Looking from these other countries toward the United States, a critical observer might perhaps inquire why our great federation of commonwealths, marching as it does in the vanguard of medical progress, has no purely ophthalmological society which can fairly be regarded as national in membership.

Some years ago the first editor of this Journal said: "Pretty much all that the greatest leaders of thought learn they learn through contact with their inferiors. . . . It is this getting out of ourselves, seeing things with other eyes . . . somewhat differently from our own, that is the essential of intellectual growth. . . . The great leaders of ophthalmology have become great through contact, first with fellow students and teachers and still more from contact with those who come to learn of them."

Can a society be truly national which does not favor to the utmost these professional contacts by which all of us ought to thrive? The members of the American Ophthalmological Society are entitled to make what they will of their organization. They may think of membership in the Society as a mark of quality which is to be limited forever to a few, but why should a national society, or one with a national title, be so conducted, as to mem-

bership and place of meeting, that it leaves great areas of the country either entirely or almost unrepresented?

A recent proposal to require ten years of practice in ophthalmology before election to membership in the Society would tend to exclude the worthiest and best trained of young ophthalmologists during their most formative years, the years when they are most likely to contribute worthwhile research.

There is room in the United States for a truly national society (or a society representative of the United States and Canada) whose purposes shall include every possible facility for improvement in professional training and contact. Much useful work of this kind has been accomplished by the American Academy of Ophthalmology and Otolaryngology. But, in view of the growing tendency to dissociate the two specialties, would it not be more appropriate for such undertakings to be in the hands of a separate ophthalmological organization? Is it too late to hope that the American Ophthalmological Society may cease to be (what it now is) one of the most exclusive important medical organizations in the world; and that it may awaken to far greater opportunities for service than it has hitherto contemplated?

W. H. Crisp

EYESTRAIN OR EYE STRESS

The publication of Donders's "Accommodation and Refraction of the Eye" directed attention to symptoms which use of the eyes may cause in other parts of the body. Studying the subject in patients who came to him for nervous diseases, S. Weir Mitchell recognized these symptoms in many patients and wrote of them as due to "eyestrain." Stress means, according to the dictionary, "force exerted to, or beyond, the point of strain." Tim-

ber subjected to stress may bend and recover its form when the stress is removed. Transparent substances, like glass, under stress act differently on light. Nerve stress, started by excessive or prolonged use of the eyes, may manifest itself by the disturbance of organs not directly concerned in vision. The autonomic nervous system, regulating the action of many organs in the body, especially the endocrine glands, can inhibit the action of some or make excessive the action of others. This part of physiology is so imperfectly known that it is easily overlooked and forgotten.

The stress of accommodation, produced by errors of refraction, poor light, or excessive use of the eyes, has demanded the attention of nearly all ophthalmologists. But the more obscure effects of such stress are very often overlooked. At first, it was assumed that the high degrees of ametropia, and particularly those that cause marked impairment of vision, were the most important; but that low degrees might be disregarded. Dr. George M. Gould, in his volumes of "Biographic Clinics," emphasized the important part played by errors of refraction in the lives of famous men. He pointed out that it was not so much the amount of the error as the effect of continuous, or prolonged, stress to correct it that determined its disastrous influence on the general health. He collected the biographies of many famous men and women, writers, students, and musicians that gave abundant evidence of the harm done by what he called "eyestrain." But in spite of Gould's writings the medical profession has failed to recognize the wider field of symptoms and disabilities that come from excessive use of imperfect eyes. It is, therefore, important to bring to the attention of ophthalmologists well-observed cases of ill health due to eye stress that

have been watched for a sufficiently long time to prove the effects of dysfunction, and to corroborate the observation by the disappearance of symptoms after exact correction of low degrees of astigmatism. The reader who thinks he can ignore the subject of eyestrain, of which he has heard so much, simply proves that he does not know the importance of the subject. Only time can tell how much more reiteration may be needed to convince ophthalmologists of the importance of the accurate correction of refraction, and avoidance of accommodative and convergence strain of the eyes. Until these things are understood there is no more important subject that can be brought to the attention of ophthalmologists.

Edward Jackson.

OUT-PATIENT SERVICE

Probably most ophthalmologists have some connection with a clinic and will therefore be interested in the paper in this issue on "Standards for out-patient service in ophthalmology" as approved and accepted in the New York Academy of Medicine in 1938. The general soundness of the report will be evident at once. Some of the details seem to the reviewer from his standpoint as a departmental head to be deserving of special comment.

Whether in private practice or in a clinic the patient likes a close personal association with his physician. He wants to consider him a friendly and not an impersonal adviser. The day of the automat in medicine has fortunately not yet arrived, and while the possibility of intimate personal contacts still exists let the most be made of it. Hence the point of referring patients on revisits back to the physician who originally examined them is important. This is not always so easy as it sounds, for the patient may return

on the wrong day or the particular doctor who examined the patient previously may have his hands full with something else. However, it pays in the added satisfaction given to have a sincere effort made to accomplish this.

A similar point, not mentioned perhaps because so obvious, is the holding in-violate of an appointment with a patient. The interne, being young, often thoughtless, and unconscious of the physical and financial sacrifice usually made by clinic patients in attending the dispensary, if he happens to have something that interferes with his appointment, such as assisting with an unexpected operation, sudden demand for a special refraction, or recording visual fields, is apt casually to direct the clinic clerk to tell the patient that he cannot be seen that day and that he must make another appointment. Although his clinic-admission fee may be returned, the patient is usually out his carfare and the half-day that he has taken from his work.

The standard nomenclature of diseases is suggested. This has now been in use in the writer's clinic for about five years and is well liked by the staff and the secretaries who handle the cross-indexing. The change over from an older system was somewhat difficult, and it was found that a considerable number of gaps had to be filled in, but the new system is working better than the old.

A periodic review of the work done in the clinic is suggested. This is really essential. Like a spring clock, the conduct of a clinic simply must be wound up every once in a while, as it runs down. This is particularly true in regard to the records. At first they are full and informative, but gradually they tend to become brief and less valuable until the individual must be stimulated to do better.

A special department for research is

suggested. This may be successful in some institutions, but usually it is most difficult to combine research—unless one includes the reporting of clinical cases in this category—and work in the out-patient department. True research requires such a great amount of time that few men can do this and attend the out-patient department unless they are on "full time" in an organization and not trying to engage in private practice.

A point that might be stressed is giving to the house staff an adequate course of systematic instruction. More and more the value of this is being appreciated and, in fact, demanded by the applicants for staff positions. The theory of self-instruction may be justified in a few instances, but the vast majority of students are incapable of educating themselves adequately without direction and supervision.

Finally, regarding the distribution of patients who are able to pay for private service, the remuneration from them rarely amounts to anything, but often the staff thinks that it is very valuable; so the greatest care should be taken to make sure that this distribution is made according to the desire of the staff and that the records are always available to them. This simple method creates a feeling of confidence and satisfaction in the staff and this in turn makes for the success of the entire out-patient department.

Lawrence T. Post.

Society and apparently has been welcomed in a manner similar to that accorded the courses given by the Academy—which is without doubt the most attractive feature of the Academy to its membership. What the ultimate outcome of these various instructional courses given in numerous places in the country will be remains to be seen; for one reason because it is undoubtedly a great strain on the ophthalmic-teacher group of the country.

The ophthalmic program was as follows: Problems in the diagnosis of abscess and tumor of the orbit, by William L. Benedict; Corneal cautery for conic cornea and corneal astigmatism, by Roderic O'Connor; Mucous membrane grafts in ophthalmic conditions, by Harold F. Whalman; The sympathetics of the head region, by O. Larsell (Ph.D.); Recurrent iritis, by E. Merle Taylor; The results of squint operations—A report of the last 286 cases at the University of Oregon Clinic, by Frederic A. Kiehle and G. H. Henton; The eye and ear in orientation and balance, by Edward Jackson; Nematode worm in the anterior chamber of the eye, by Clinton T. Cooke. The last-named is an interesting report of an occurrence rare in the West, illustrated with a colored reproduction.

Lawrence T. Post.

BOOK NOTICES

TRANSACTIONS OF THE PACIFIC COAST OTO-OPHTHALMOLOGICAL SOCIETY, 1938. Twenty-sixth annual meeting, Victoria, B.C. Cloth-bound, 205 pages, illustrated.

This volume conforms to the style of previous Transactions of this Society. It indicates that the idea of instruction courses has been utilized again by the

THE CLINICAL AND EXPERIMENTAL USE OF SULFANILAMIDE, SULFAPYRADINE AND ALLIED COMPOUNDS. By Perrin H. Long, M.D., and Eleanor A. Bliss, Sc.D. 319 pages. New York, The Macmillan Co. Price \$3.50.

The introduction of sulfanilamide and related derivatives into clinical medicine has created an enthusiasm and confidence

rarely witnessed, at least in magnitude. The result is that medicine has become chemotheropoeusis-conscious at a time when treatment of infections with chemical agents had receded to a low ebb. This consciousness has now assumed such proportions that it is more than possible that sulfanilamide will be remembered not so much for its therapeutic properties as for having furnished the incentive towards more effective and less toxic agents.

It is, therefore, at a timely occasion that this monograph is presented by two workers prominent in this field by their own right because a number of the original experiments were done by them and their knowledge of the literature is so complete. The book opens with a historical chapter—if six years can be considered history—tracing the development of sulfanilamide therapy. Then there are two chapters on essentially experimental information, the one describing treatment of experimental infection and the other enumerating toxic manifestations induced in various animals. There follows a thorough chapter on the mode of action of sulfanilamide and related compounds, in which 150-odd references are cited and in which the conclusion is drawn that “no theory has been evolved which adequately explains the mode of action and one must be content with the single conception that they inhibit the growth of susceptible microorganisms.” The remainder of the book is devoted to the clinical uses of these sulfur-benzene compounds.

If the literature is estimated conservatively, it may be said that sulfanilamide is effective in streptococcal, meningococcal, and gonococcal infections. There are indications that this list may be enlarged, but at the present time the evidence is too meager and also contradictory. Sulfapyradine, on the other hand, will probably find its greatest usefulness in pneumococcal infections. The sections on sulfapyradine are perhaps premature, since reports are still in the process of publication, and it will take time to collect the incoming data.

The authors appear to be writing in a crusading spirit and to be distinctly inclined towards enthusiasm. Nevertheless, the monograph is well presented, it covers the literature thoroughly and fairly, and it has been written in a smooth and readable manner.

There is little doubt in this reviewer's mind that the entire subject is still in a state of flux and that time will reveal important and necessary additions and revisions. It is a rather common vagary of medical practice to greet enthusiastically a new treatment, with the first reports very favorable. The more conservative workers accumulate and assemble their data more slowly, and their reports are consequently late in appearance. So in this case time alone will provide the answer as to how effective this family of drugs is in the different infections, and what eventual harm will accompany the indiscriminate use of potentially toxic substances.

L. A. Julianelle.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP
ASSISTED BY DR. GEORGE A. FILMER

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

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| 1. General methods of diagnosis | 10. Retina and vitreous |
| 2. Therapeutics and operations | 11. Optic nerve and toxic amblyopias |
| 3. Physiologic optics, refraction, and color vision | 12. Visual tracts and centers |
| 4. Ocular movements | 13. Eyeball and orbit |
| 5. Conjunctiva | 14. Eyelids and lacrimal apparatus |
| 6. Cornea and sclera | 15. Tumors |
| 7. Uveal tract, sympathetic disease, and aqueous humor | 16. Injuries |
| 8. Glaucoma and ocular tension | 17. Systemic diseases and parasites |
| 9. Crystalline lens | 18. Hygiene, sociology, education, and history |
| | 19. Anatomy, embryology, and comparative ophthalmology |

1

GENERAL METHODS OF DIAGNOSIS

Bangerter-Blaser, Katharina. The value of slitlamp microscopy of the ocular fundus compared with other methods of fundus study. *Ophthalmologica*, 1939, v. 96, Jan.-Feb., p. 224.

The author presents a series of studies of the fundus oculi of 42 patients as explored by the following methods:

(1) direct and indirect ophthalmoscopy, (2) red-free ophthalmoscopy according to Vogt, (3) with the large Gullstrand ophthalmoscope, and (4) with contact glass and slitlamp. The study indicated that examination with slitlamp and contact glass could supply valuable supplementary details and in some instances make clear an otherwise obscure diagnosis. F. Herbert Haessler.

Ferree, C. E., and Rand, G. Higher visibility in a roentgenogram illuminator. *Arch. of Ophth.*, 1939, v. 21, Jan., pp. 70-75.

The amount of light needed to give the highest power of discriminate detail

varies with the person making the examination and the density of the roentgenogram. An illuminator was devised to give a variation in the intensity of light in continuous series from zero to full, without change in the color or composition of the light, by means of a rotatable shutter the contiguous vanes of which turn in opposite directions. (Illustrations.) J. Hewitt Judd.

Juler, F. A. A projection scotometer. *Brit. Jour. Ophth.*, 1939, v. 23, April, pp. 239-242.

The author here describes an apparatus he has used in clinical experimental work for more than a year and reports its advantages over ordinary methods with screen and discs on holders. This apparatus overcomes the handicaps of sound and sight of the carrier in the usual methods of procedure. The illustration accompanying the article demonstrates the use of the apparatus. D. F. Harbridge.

Kaminskaja-Pavlova, Z. A. The "crawling ray" in biomicroscopy.

Viestnik Opht., 1939, v. 14, pt. 4, p. 53.

To the standard methods of slitlamp illumination, the author adds a new method, which she designates as "crawling illumination." It consists in placing the slitlamp perpendicularly to the temple and moving the ray thus formed slowly across the cornea. This illumination, she claims, facilitates the examination of the lens and brings out fine changes on the surface of the iris not demonstrable otherwise.

Ray K. Daily.

2

THERAPEUTICS AND OPERATIONS

Berens, Conrad. Iridocapsulotomy scissors. *Amer. Jour. Opht.*, 1939, v. 22, May, pp. 543-544; also *Trans. Amer. Opht. Soc.*, 1938, v. 36, p. 281.

Biontovskaja, E. T. The use of lysozyme in ophthalmology. *Viestnik Opht.*, 1939, v. 14, pt. 1, p. 44.

To determine the effect of lysozyme on infectious ocular diseases, and to analyze its stimulative, regenerative, analgesic, and lytic properties it was used in 75 clinical cases and in 31 laboratory tests. The conclusions are that in severe purulent keratitis the effect of lysozyme is negative; in young patients staphylococcus ulcers respond favorably to lysozyme treatment; in pneumococcus ulcers the reaction is negative and the gravity of the infection contraindicates temporizing and calls for prompt energetic measures. In acute conjunctivitis lysozyme is not useful; but it seems to have a good influence on gonoblennorrhea. In three cases of eczematous dermatitis of the lids and in a burn the results were good. The author concludes that in the majority of cases the therapeutic effect of lysozyme is negative; its regenerative action is doubtful, but it apparently pos-

sesses analgesic properties. Clinically and in the laboratory its bactericidal action was negative in the majority of cases, the staphylococcus being less resistant than the pneumococcus.

Ray K. Daily.

Corelli, F., and Ciotola, G. Desensitizing therapy in ocular allergic forms. *Boll. d'Ocul.*, 1938, v. 17, June, pp. 444-451.

The authors report in tabulated form fifty patients aged from nine to 62 years affected by eye diseases whose etiologic factor showed an allergic component. They were treated with an aspecific desensitizing therapy used by Corelli in general medicine and consisting of intravenous injections of a solution containing hyposulphite of magnesia, calcium chloride, and glucose. Good results were noted in blepharoconjunctivitis, some forms of keratitis, and eczema of the lids. The article closes with a discussion on the mechanism of action of this therapy. (Bibliography.)

M. Lombardo.

Cornet, Emmanuel. Flexible borated collodion used as a dressing. *Revue Internat. du Trachome*, 1939, v. 16, Jan., p. 47.

The author, noting that the tears and conjunctival secretion often cause breaking down of operative wounds, suggests that flexible borated collodion be applied to the wound. He omits the occlusive bandage.

J. Wesley McKinney.

Grosz, Stefan. The importance of vitamin B in ophthalmology. *Graefe's Arch.*, 1939, v. 140, pt. 1, pp. 149-170.

It has been demonstrated that in the administration of vitamin B₁ it must usually be accompanied by B₂, since part of the factors of the B group only

exert their action together. Vitamin B₁ is chiefly important in inflammation of the optic nerve of the alcoholic type, and also in other toxic or metabolic amblyopias. These conditions are really hypovitaminoses (an increased demand or poor absorption). The tobacco-alcohol toxic amblyopia is not entirely due to avitaminosis, but the optic nerves are attacked by tobacco and alcohol because they are suffering from a lack of vitamins. It is fundamentally important that the further use of tobacco and alcohol be prohibited. In this first group, the B therapy has only a substitutional character. In the second group, the treatment with vitamin B in acute retrobulbar neuritis from multiple sclerosis, in tabetic optic atrophy, in paralysis of the ocular nerves from different factors, and in the postdiphtheritic paralysis of accommodation is still in the experimental stage. The third group includes uveitis of uncertain origin, and diseases of the eyelids, hordeolum, rosacea, and phlyctenulosis. A hypovitaminosis is assumed to be present here also. In the fourth group, a soothing action with B₁ is possible in cases of corneal herpes and principally in herpes zoster. Here the vitamin acts as a remedial agent and not as a substitutive agent in a deficiency disease. Indications for B₂, in addition to the diseases of groups one and two are phlyctenulosis, pernicious optic atrophy, and Adie's syndrome (in the latter accompanied by B₁). H. D. Lamb.

Harman, N. B. A pin eye-dropper. *Brit. Jour. Ophth.*, 1939, v. 23, March, p. 212.

This describes a pin fastened to an appropriate handle. By dipping the head of the pin into oily solutions a very small globule can be transferred to the eye. (Illustration.)

D. F. Harbridge.

Heath, Parker. Anterior-chamber irrigator. *Arch. of Ophth.*, 1939, v. 21, Feb., p. 359. (See *Amer. Jour. Ophth.*, 1938, v. 21, Nov., p. 1295.)

Horner, W. D. A special solvent dispenser for the removal of adhesive-plaster dressings. *Amer. Jour. Ophth.*, 1939, v. 22, May, p. 541.

Kirby, D. B. Suture material for ocular operations. *Amer. Jour. Ophth.*, 1939, v. 22, May, p. 544; also *Trans. Amer. Ophth. Soc.*, 1938, v. 36, p. 279.

Klar, R. Investigations on the velocity of sedimentation of the blood corpuscles before and after eye operations. *Klin. M. f. Augenh.*, 1939, v. 102, March, p. 321.

Observations on 100 patients showed no acceleration of the sedimentation time after intraocular or extraocular operations. The author believes that the small extent of wound surface is the chief reason. C. Zimmermann.

Satz, L. B., and Medvedjev, H. I. Clinical observations on Schick's method of injecting blood into the anterior chamber for ocular diseases. *Viestnik Opht.*, 1939, v. 14, pt. 1, p. 61.

From experience with nine clinical cases it appears that the procedure is harmless, and influences favorably the course of the disease in tuberculous and infectious diseases of the anterior ocular segment.

Ray K. Daily.

Sharkovski, I. A. Dry gangrene as a complication of adrenalin medication. *Viestnik Opht.*, 1939, v. 16, pt. 1, p. 116. (See Section 16, Injuries.)

Stallard, H. B. A new needle holder. *Brit. Jour. Ophth.*, 1939, v. 23, May, pp. 330-331.

A needle holder designed for use in

ophthalmic operations is described. (Illustrations.) D. F. Harbridge.

Talkovskii, C. I. Pathogenesis and therapy of scrofulous eye diseases. *Viestnik Opht.*, 1939, v. 14, pt. 4, p. 44.

The author is very enthusiastic about intramuscular injections of thymol and cod-liver oil. Of the patients examined 53 percent were found to have ascarides, for which the thymol is effective. A tabulation of 68 clinical cases supports the author's theory.

Ray K. Daily.

Traquair, H. M. Anesthesia in ophthalmic surgery. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 2, p. 697.

A review of the local anesthetics, instruments, and methods, and the technique for special operations are given. Premedication is discussed as well as the limitations of local anesthesia.

Beulah Cushman.

Venco, L. The appearance of sulphanilamide in the lacrimal fluid, in the aqueous, and in the vitreous after administration of the organic derivatives of sulphur; and its antibacterial action. *Ann. di Ottal.*, 1939, v. 67, Jan., p. 30.

The author by means of color reactions has attempted to determine the presence of sulphanilamide in the lacrimal fluid of individuals treated with sulphanilamide and its combinations. He describes the technique employed in his experimental research conducted on rabbits, and discusses the determination of sulphanilamide in the ocular humors following its gastric ingestion, and the bactericidal action of the drug. (Bibliography.) Park Lewis.

Yanes, T. R. The art of therapy in ophthalmology. *Rev. Cubana de Oto-Neuro-Oft.*, 1938, v. 7, July-Oct., p. 81.

A comprehensive article dealing with

methods and drugs employed in the treatment of diseases of the eye. A discussion of the various types of ophthalmic drugs, such as antiseptics, miotics, and cycloplegics, is given in some detail with recommendations as to the manner of their employment, dosage, toxicity, and incompatibilities. Procedures in the general treatment of eye disease and ocular physiotherapy are also given. Edward P. Burch.

3

PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Baevski, I. L. Vision of sharpshooters. *Viestnik Opht.*, 1939, v. 14, pt. 1, p. 126.

A controversial comment.

Bari, Enzo di. Partial amblyopia in the astigmatic eye as revealed and measured by the di Bari quadrant resolvimeter. *Boll. d'Ocul.*, 1938, v. 17, Sept., pp. 785-795.

The author describes his apparatus and its use in determining and measuring this type of amblyopia. He reports such cases to show that the meridian of greater amblyopia coincides with the axis of the correcting cylinder.

M. Lombardo.

Berens, Conrad. Prism scale for use at 50 centimeters. *Amer. Jour. Ophth.*, 1939, v. 22, May, pp. 542-543; also *Trans. Amer. Ophth. Soc.*, 1938, v. 36, p. 280.

Berens, C., and Loutfallah, M. Aniseikonia: a study of 836 patients examined with the ophthalmo-eikonometer. *Amer. Jour. Ophth.*, 1939, v. 22, June, pp. 625-641; also *Trans. Amer. Ophth. Soc.*, 1938, v. 36, p. 234.

Bucalossi, Antonio. An evaluation of the polychromatic stimuli and the physical and physiologic causes of im-

perfect discriminating power in the eye. *Ann. di Ottal.*, 1939, v. 67, Feb., p. 93.

The chromatic function of the eye is generally considered to have reached a high degree of perfection in its discrimination of tone, intensity, and saturation. The trained eye, such as that of a painter, can generally match observed colors so that they cannot be distinguished apart. By means of certain tests, however, it may be demonstrated that the human color sense is far from perfect; it is well known that aberrations in both form and color are present. Through a complicated series of physical, chemical and biologic phenomena, the eye possesses the power of modifying the nerve impulse carried to the visual center. These differences, while demonstrable, usually pass unnoticed and cause no disturbances in visual sensibility. Failure to perceive chromatic aberration is due to the fact that the eye is focused for the more intense light; other rays forming circles of diffusion are unnoticed, the eye being able to accommodate itself only for rays of the same wave length.

A purely physiologic function is also involved. Pure colors do not appear in nature. Only to a certain point is the eye capable of responding to color stimuli other than that which is dominant. Colors in nature are complex and the eye is trained to respond only to the combined stimuli and not to individual stimuli arising from the substances of which the object is composed.

Park Lewis.

Burian, H. M. *Fusional movements; rôle of peripheral retinal stimuli.* *Arch. of Ophth.*, 1939, v. 21, March, pp. 486-491; also *Trans. Sec. on Ophth., Amer. Med. Assoc.*, 1938, 89th mtg., p. 202.

The method described permits stimu-

lation of any desired areas of the two retinas with identical stimuli whose relative position, size, shape, and brightness can be controlled. Studies were conducted to learn how identical objects imaged on strictly peripheral disparate points of the retina affect the relative position of the two eyes. The displacement was accomplished by an arrangement of several projection lanterns, and polarizing material in front of the lanterns and the apertures for the observer. Vertical displacements were studied and the measurements obtained showed a high degree of accuracy. It was found that powerful, fusional stimuli are exerted by peripheral retinal areas, that these stimuli affect the relative position of the eyes, and under certain conditions even cause a loss of central fusion. J. Hewitt Judd.

Cantamessa, Gustavo. *The phenomenon of the eye in darkness and twilight vision.* *Boll. d'Ocul.*, 1938, v. 17, June, pp. 492-493.

The writer, while looking at a multi-colored carpet in diffuse light, covered one eye for a period of time. On uncovering the eye he noted that the colors, especially red and yellow, appeared to have a very warm tone to this eye while all colors appeared to have a cold tone to the other eye. He discusses this phenomenon and concludes that stimulation of the chromatic sense depends upon chemical substances which are destroyed by light and reform in the dark. In order that color perception be effected, color radiations must occur in sufficient quantity and intensity, otherwise a non-colored sensation is produced. The eye in the dark has a more vivid perception for colors. At twilight the cones acquire a greater chromatic sensibility since the rods are more sensitive to the non-colored light.

M. Lombardo.

Cogan, F. C., and Cogan, D. G. Recovery time from color fatigue in the peripheral visual field. *Ophthalmologica*, 1939, v. 96, Jan.-Feb., p. 267.

A method is described for measuring recovery time from a colored stimulus in the peripheral field. When magenta red is the primary stimulus, a dark-gray secondary stimulus causes recovery at a higher level, but in the same time as a light-gray one. A complementary green of the same brightness as gray shows the same recovery time. The recovery period is shorter at 30 degrees than at 10 degrees and movement of the eyeball has no effect on recovery time.

F. Herbert Haessler.

Dean, F. W. Frequency of phorias, importance of prism correction. *Arch. of Ophth.*, 1939, v. 21, March, pp. 511-512.

In the first group of 10,000 patients, 574 were given prisms for the correction of esophoria, 613 for the correction of exophoria, and 288 for the correction of hyperphoria. Prisms were found to be of benefit for exophoria and hyperphoria but not for esophoria, and their use in this condition was discontinued. In the next group of 8,000 patients prisms were used for correction of hyperphoria in 577, and for exophoria in 1,328. In the third group of 3,000 patients prisms were prescribed in 285 for hyperphoria, and in 223 for exophoria. The author reports that the wearing of prisms did not cause a change in the amount of the phoria, but that the patients with exophoria and hyperphoria were very much more comfortable with their phorias corrected.

J. Hewitt Judd.

Doesschate, G. Ten, and Fischer, F. P. Representing and observing per-

spective. *Ophthalmologica*, 1939, v. 97, April, p. 1.

The authors analyze the effects of perspective drawings and elucidate their ideas by means of many diagrams. They show that the rules of constructive perspective alone are not adequate for perspective representation. Physiologic and psychologic factors must always coöperate to give an idea of space.

F. Herbert Haessler.

Eggers, Harry, Aids in the fitting of contact lenses. *Arch. of Ophth.*, 1939, v. 21, April, pp. 647-649.

The usual procedure may be shortened by the elimination of the ophthalmometric determination and by the substitution of an instantaneous formula for the graph and table. Additional spherical power in a trial frame may be converted rapidly into an equivalent larger or smaller corneal radius in the contact lens by means of two empiric formulas, one for myopic and the other for hypermetropic patients. These formulas were made up from data obtained in examination of 152 patients.

J. Hewitt Judd.

Ferree, C. E., and Rand, G. Testing fitness for night flying; speed of change of adjustment of the eyes for intensity of light and distance of object. *Amer. Jour. Ophth.*, 1939, v. 22, June, pp. 655-660.

Kompaneiski, B. H. Depth perception. An analysis of the theory of stimulation of disparate points. *Viestnik Opht.*, 1939, v. 14, pt. 1, p. 90.

The detailed report of a laboratory investigation shows that there is a threshold of fusion of images from disparate retinal points, and that it can be calculated mathematically. Fusion of afterimages of two not-quite-corres-

ponding retinal points stimulated alternately, shows that convergence is not a factor in depth perception, as long as the distance between the two objects is less than the threshold of fusion. Tests with two stereoscopic objects, and one object in front of these seen by one eye only, show that convergence plays no part in judging the distance of the single object, which is seen at the same distance as the stereoscopic object. Perception of irregularly placed objects demonstrates the existence of a zone of fusion in the retina. The perception of stereograms moved in opposite directions also proves that convergence is not a factor in depth perception.

Ray K. Daily.

Kravkov, S. V. The influence of caffeine on color sensitivity. *Acta Ophth.*, 1939, v. 17, pt. 1, p. 89.

This investigation deals with the effect of caffeine on the ocular sensitivity to the red and green portion of the spectrum. The data obtained show that it is increased. The effect of the drug appears twenty minutes after its ingestion and lasts forty minutes. The maximum increase in color sensitivity was 40 percent.

Ray K. Daily.

Krimsky, Emanuel. Psychologic considerations in the study of binocular function. *Arch. of Ophth.*, 1939, v. 21, April, pp. 662-670.

This discussion includes the meaning of fusion, duction readings in relation to psychologic influences, the meaning of stereoscopic pictures, the requisites of a binocular instrument with a critical analysis of methods used in binocular study and training, what to expect from orthoptic training, the rôle of technician or orthoptist, and orthoptic training as a problem for the ophthalmologist. A comprehensive plan for closer coöperation between clinician

and psychologist is suggested. (Discussion.)

J. Hewitt Judd.

Lowe, G. B. A bicylindrical type reader. *Brit. Jour. Ophth.*, 1939, v. 23, March, pp. 212-213.

This is a description of a new type hand reading glass. Two plano-cylinders of six diopters each lie back to back on the horizontal furnishing a power of twelve diopters. Legibility is increased through an increase in the height of the letters. A black etched line across the lower third of the lens furnishes a guide for an actual vertical reading. The glass is recommended for those, especially the aged, with damaged macular perception, and for those with obstructions in the media whether in the cornea, lens, or vitreous. (Illustrated.)

D. F. Harbridge.

Luckiesh, M., and Moss, F. K. Frequency of blinking as a clinical criterion of ease of seeing. *Amer. Jour. Ophth.*, 1939, v. 22, June, pp. 616-621.

Maisler, S. Casts of the human eye for contact lenses. *Arch. of Ophth.*, 1939, v. 21, Feb., pp. 359-361.

Molds of the eye can be made more quickly with the new gel known as Kerr's hydrocolloid applied in a special silver molding shell. To enhance the rapid setting or chilling of the gel, a double-chambered shell and handle with an upper inlet and a lower outlet for quick cooling with ice water can be used. Casting is done with a French dental plaster soon after the mold is obtained, because some shrinkage may take place if the mold is exposed to air too long.

J. Hewitt Judd.

Ogle, K. N. Induced size effect. 2. An experimental study of the phenomenon with restricted fusion stimuli. *Arch. of Ophth.*, 1939, v. 21, April, pp. 604-625.

This phenomenon, in which an apparent rotation of the binocular field occurs when a meridional size lens is placed before one eye so as to change the size of the retinal image in the vertical meridian only, was studied by using simpler and restricted fusion patterns in order to obtain a finer analysis. It was found that the introduction of a difference in the sizes of the images in the vertical meridian did not cause an induced size effect unless there were at least two separated vertical contours in the binocular visual field. This difference in the sizes of the images for the maximum induced size effect decreases with increasing separations of the fusion contours. The magnitude of the maximum induced size effect decreases with increasing angular distances of the fusion contours from the fixation point. The maximum sensitivity (the apparent rotation of the binocular visual field for a 1-percent difference in the sizes of the images at the center of symmetry) varies with the observers and with the patterns but is nearly constant for different visual angles subtended by the fusion contours.

J. Hewitt Judd.

Olsho, S. L. **Vertical prism imbalances in bifocal lenses coexistent with hyperphoria.** *Arch. of Ophth.*, 1939, v. 21, March, pp. 515-521.

The method for estimation of the vertical prism imbalance caused by the differences in the vertical effective powers in lenses is described. Consideration of this will prevent the prescribing of lenses which produce an excessive vertical imbalance and will permit the correction of hyperphorias within limits which can be tolerated.

J. Hewitt Judd.

Pascal, J. I. **An aid toward correctly inserting contact lenses.** *Arch. of*

Ophth., 1939, v. 21, March, pp. 513-514.

To facilitate correct orientation of the glass during its application, the rubber sucker used for inserting the contact glass is marked with a white stripe to correspond with the fine etched line on the lens.

J. Hewitt Judd.

Piša, Antonin. **The binocular visual range in domestic animals.** *Graefe's Arch.*, 1939, v. 140, pt. 1, pp. 1-54.

The writer's axoperimeter based upon the principle of the binocular perimeter of Tschermak-Seysenegg is described. This instrument is used to measure the extent of the binocular visual range by means of transcleral images, and also to determine the ocular axes by use of the central and peripupillary reflex. The animals measured were rabbits, guinea pigs, fox terriers, pointers, greyhounds, rattlers, goats, cattle, and horses. Systematic measurements of the extent of the binocular visual range in these animals are carefully tabulated. The position of the ocular axes is characterized by the spherical geographic coördinates. From these, the divergence of the ocular axes and the elevation of the plane of the ocular axes are determined. Curves formed by movements of the vertex of the cornea with regard to the range of orientation of the head and with regard to movements of the ocular axes are given for most of the animals studied.

H. D. Lamb.

Rabkin, E. B. **Binocular spectral anomaloscope.** *Viestnik Opht.*, 1939, v. 14; pt. 1, p. 84.

A description of an anomaloscope which permits the determination of the threshold of perception for the entire spectrum and for each chromatic component separately. The intensity of the

color can be varied through a system of diaphragms, and the eyes can be tested monocularly and binocularly. (Illustrations.) Ray K. Daily.

Scardaccione, Mario. Researches on the action of the melanophore hormone (intermedine) on the adaptation time to darkness and luminous excitability in the normal individual and in retinitis pigmentosa. *Boll. d'Ocul.*, 1938, v. 17, Sept., pp. 755-775.

Investigating the effect of intermedine (prepared from the median and posterior lobe of the hypophysis) on the eyes of *Scardinius erythrophthalmos* and of *Rana aesculenta*, the writer determined that in all cases the preparation provokes expansion of the chromatophores and a tendency of the pigment to dispose itself toward the position found in dark adaptation. Other observations showed that this hormone shortened the dark-adaptation time and the luminous excitability both in normal persons and in cases of retinitis pigmentosa. (Bibliography.) M. Lombardo.

Schubert, G. The aniseikonia question. *Graefe's Arch.*, 1939, v. 140, pt. 1, pp. 55-60.

Aniseikonia which occurs in asymmetrical convergence under definite conditions of haploscopic sight is due either to an asymmetry of the image-producing apparatus of the eyes or to an asymmetry of the subjective-test object. In the observed subjective similarity of images, there exists no compensatory mechanism which with asymmetrical convergence produces an unequal size of images when an object is observed with both eyes. Through the presentation of two equally sized and equally distant but incongruous objects (circle and quadrant), fusion is only made more difficult. Not only are the

half images not united as a single image, but these images by binocular observation with asymmetric convergence do not even appear to be at the same distance. Therefore the image for each eye must appear to be of a different size. The phenomenon of this latter aniseikonia cannot therefore be used, as was claimed, for the determination of the functional size of the image for each eye. H. D. Lamb.

Shagov, M. A. A device for testing visual acuity. *Viestnik Opht.*, 1939, v. 14, pts. 2-3, p. 111.

A description of an illuminated test box. (Illustrations.) Ray K. Daily.

Sjörger, Henrik. A new series of test cards for determining visual acuity in children. *Acta Ophth.*, 1939, v. 17, pt. 1, p. 67.

The test object consists of the design of a hand constructed on the Snellen principle. The merit claimed for it is that even two-year-old children can respond to it. (Illustrations.)

Ray K. Daily.

Vannas, M. An improved trial frame. *Acta Ophth.*, 1938, v. 16, pt. 4, p. 595.

The improvement consists in attaching the occluders to the frame. (Illustration.) Ray K. Daily.

Waugh, D. D. A combination of the Snellen and the Landolt test types. *Arch. of Ophth.*, 1939, v. 21, April, pp. 671-672.

The combination is obtained by using a circle subtending a visual angle of three minutes, having a central aperture of 1-minute angle. This letter "o" is transformed into a "q" by the addition of a 1-minute stem below and to the right of the "o." A 1-minute stem below and to the left makes the letter "p," and so on. A break in the circle

subtending a 1-minute angle makes the letter "u" or "c," and with the 1-minute stem added, forms a "y," "f," or "h." However, some patients would have difficulty in interpreting the letters.

J. Hewitt Judd.

Wincor, H. G. New scissors for enucleation. *Arch. of Ophth.*, 1939, v. 21, April, p. 672.

By means of an elevation on the anterior blade of approximately 6 mm. this type of scissors insures obtaining a portion of the nerve with the globe, and the globe is protected from being cut or injured.

J. Hewitt Judd.

Wright, W. D., and Granit, R. On the correlation of some sensory and physiological phenomena of vision. *Brit. Jour. Ophth.*, 1938, monograph supplement 9, 80 pages.

The subject matter of this monograph divides itself into three sections: the physiological side represented by recent work on photochemistry and electrophysiology; fundamental sensory phenomena of vision (stressing the correlations which seem reasonably evident); and the correlation of some sensory and physiological phenomena. Under the first section a discussion of anatomical facts involving the complicated retinal structures from a neurophysiological point is presented. Electrophysiological facts concerning excitation in the retina are elucidated by experiments in electroretinograms, electro-adaptation, fast and slow retina, forms of intersection, the rod spectrum, and the cone spectrum. Section two goes into the matter of sensory phenomena under the headings of static characteristics and dynamic characteristics, the discussion dealing with normal vision, luminosity, color, central and peripheral vision, directional sensitivity of retina, analysis of the color-

perception mechanism, and other topics. Section three discusses the problem of discrimination, the time course of response, the color-perception mechanism, and related subjects. (Figures, references.)

D. F. Harbridge.

Zaffke, K. H. Normal curves of the dark adaptation in absolute threshold values with Birch-Hirschfeld's light-sense tester. *Graefe's Arch.*, 1939, v. 140, pt. 1, pp. 61-69.

The light-sense tester of Birch-Hirschfeld permits a comparison between the threshold stimulus of the patient and that of the observer. Therefore this apparatus permits only a measurement of the relative value of the threshold stimulus. The average normal curve of values for thirty normal individuals is plotted. With this curve, it is possible to determine absolute threshold values and to carry out with this apparatus reliable comparisons between normal and affected persons.

H. D. Lamb.

4

OCULAR MOVEMENTS

Bender, M. B., and Weinstein, E. A. Dissociated monocular nystagmus with paresis of horizontal ocular movements. *Arch. of Ophth.*, 1939, v. 21, Feb., pp. 266-272.

Three cases are reported in which there was paresis of lateroversion with paralysis of the internal rectus muscle and nystagmus only in the eye on the side to which the gaze was directed. The same ocular disturbances were produced in monkeys by sectioning the posterior longitudinal bundle at the level of the facial colliculi.

J. Hewitt Judd.

Bielschowsky, A. Lectures on motor anomalies. 9. Oculomotor-nerve paraly-

sis and ophthalmoplegias. *Amer. Jour. Opth.*, 1939, v. 22, May, pp. 484-498.

Bielschowsky, A. Lectures on motor anomalies. 10. Supranuclear paralyses. *Amer. Jour. Opth.*, 1939, v. 22, June, pp. 603-613.

Carow, Rudolf. Observations on the rolling of the eyes in near and the elevation-depression rotation of the eyes. *Graefe's Arch.*, 1939, v. 140, pt. 1, pp. 86-115.

With the Harms cyclophorometer, 107 individuals were measured as to rotation of the eyes at near and the elevation-depression rotation. The rotation at near always consisted of a movement of declination of both eyes, usually increasing the declination of the longitudinal middle plane of the primary position. Elevation of the plane of sight was present only in mild degree in distance, but was increased with a rotation of the eyes outward at near. Depression of the plane of sight resulted in a diminution of the outward rotation of the eyes. In each case, the near and the elevation-depression rotations of the eyes were not uniform. Their origin is apparently dependent upon individually different anatomic and innervatory peculiarities. These reactions seem to be not so much extra rotations as heterophorias in the broadest meaning of the word. H. D. Lamb.

Jaensch, P. A. The operative treatment of isolated binocular paresis of the trochlearis. *Klin. M. f. Augenh.*, 1939, v. 102, March, p. 305.

A man of 33 years fell from a tree and suffered concussion of the brain with loss of consciousness for twelve hours. After a few days he noticed disturbing diplopia caused by an isolated paralysis of both superior oblique muscles. Recession of the inferior recti in

two sittings was ineffective. Indications for this and other operations (myectomy of the inferior oblique) are discussed. This case illustrates the great difficulty of curing diplopia due to paralysis of two homonymous vertical motors. However, good results were finally obtained after multiple procedures on both eyes. The affection was probably caused by damage to the roots of the nerves in the velum medullare. C. Zimmermann.

Jameson, P. C. Entity of muscle recession. A short résumé of its technique and principles with new supplementary notes and illustrations. *Arch. of Opth.*, 1939, v. 21, Feb., pp. 362-370.

The author discusses the technique of the operation, the instrumentation, suture material, and the tests necessary for proper computation and gradation in any given case. (Illustrations.)

J. Hewitt Judd.

Motolese, Francesco. Bilateral paralysis of the external rectus muscle associated with papilledema from novocaine rachianesthesia. *Boll. d'Ocul.*, 1938, v. 17, Aug., pp. 629-634.

A woman of 34 years soon after an operation performed under spinal anesthesia became affected by headache and then by vomiting. A month later she developed diplopia due to paralysis of both external rectus muscles. The visual acuity was found to be markedly reduced, the visual fields contracted for form and color, and both discs affected by pronounced edema. The headache and paralysis disappeared after the third spinal puncture but the visual acuity and fields remained permanently damaged. The picture was one of serous meningitis. Another patient of forty years after a spinal anesthesia became

affected by headache and ten days later by paralysis of the left external rectus muscle. The symptoms spontaneously disappeared 2½ months after their appearance. A discussion of the etiology and mechanism of action of the syndrome closes the article. (Bibliography.)
M. Lombardo.

Mutch, J. R. Foville's syndrome—record of a case. *Brit. Jour. Ophth.*, 1939, v. 23, April, pp. 225-238.

A male, aged 56 years, had a pontine lesion with focal signs. The positive findings on examination revealed: paralysis and atrophy of muscles of the left side of the face, left internal strabismus, loss of conjugate movement of both eyes to the left, right ptosis, unequal pupils, horizontal nystagmus when looking to the right, slurring speech, sclerosis of retinal vessels, and unsteadiness of gait with a tendency to fall to the left. The blood supply to the pons is discussed, the author concluding that there was a thrombosis of a median branch of the basilar artery. (Illustrations, references.)

D. F. Harbridge.

Weekers, F. A procedure for muscular advancement in high degrees of divergent strabismus. *Ophthalmologica*, 1939, v. 96, Jan.-Feb., p. 210.

The author describes a method of advancement of the internal rectus which he recommends highly because the muscle is not apt to slip and because placing sutures through the sclera is avoided. The conjunctiva is incised at the limbus from the 12-o'clock to the 6-o'clock position. The internus is then undermined and a suture is passed through the muscle from below and out through the conjunctiva near its edge. The suture is tied and one end passed under a loop of silk suture which

has been placed under the tendon of the externus without conjunctival incision. When the internus suture is knotted about the loop, the internus and conjunctiva are drawn completely over the cornea. After a week, the sutures and the portions of conjunctiva and muscle which overlie the cornea are removed. The remaining tissues quickly fall into normal position. Deviation of 40 degrees can be corrected with no limitation of movement resulting.

F. Herbert Haessler.

Weve, H. A useful variant of Lancaster's stitch in muscle advancement. *Ophthalmologica*, 1939, v. 96, Jan.-Feb., p. 217.

Weve finds Lancaster's stitch the most useful in muscle advancement, but notes that it has one drawback. The knotting of the suture, a most important step of the operation, is often difficult. Weve has modified the procedure as follows: He places the suture through the muscle as Lancaster does but does not, as a next step, place the same suture in the sclera. Instead, he carries a separate suture through the tendon and ties the muscle-suture ends to the ends of the second suture. The silk is buried and rarely removed.

F. Herbert Haessler.

5

CONJUNCTIVA

Allende, F. P. Observations on varicose veins of the conjunctiva, corneal ulcer, corneal leucoma (tattooing), and astigmatism. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, Sept., p. 492.

A potpourri of clinical observations upon varicosity of conjunctival vessels, treatment of corneal ulcer by subconjunctival injections of methylene blue, tattooing of corneal scars, and the relative occurrence of astigmatism with or

against the rule in the young and aged in a small series of cases.

Edward P. Burch.

Applemans, M. Parinaud's conjunctivitis caused by the virus of lymphogranulomatosis inguinalis. *Ophthalmologica*, 1939, v. 96, March, p. 321.

The author discusses lymphogranulomatous lesions in general. He indicates that Parinaud's conjunctivitis is in many respects similar to lymphogranulomatosis inguinalis and may be caused by the same virus. He reports his findings in a patient in whom this was true as demonstrated by the intra-dermal reaction of Frei. The infection was a laboratory accident.

F. Herbert Haessler.

Arruga, H. New technique for operating upon pterygium. *Ophthalmologica*, 1939, v. 96, March, p. 333.

Arruga stains the conjunctiva of the upper quadrant with a 10- or 15-percent solution of gentian violet. This is important because in a later stage of the operation it becomes very difficult to distinguish the epithelial surface from the deeper one except for the stain. He then extirpates the entire pterygium, starting at the corneal tip and carrying the incision as far out as the caruncle. The conjunctiva is then undermined and a flap cut from the colored portion is brought down to cover the denuded area. It is held in its new position by sutures placed at the limbus above and at the free edge of the original lower margin of the pterygium.

F. Herbert Haessler.

Bietti, Giambattista. Spectrographic investigations on the presence of metals in the conjunctiva. *Boll. d'Ocul.*, 1938, v. 17, Sept., pp. 729-737.

Qualitative and quantitative analyses were made on small pieces of nor-

mal and pathologic human conjunctiva, and on the conjunctiva of rabbits treated by instillations of collyria containing metal bases. This method can also be used to indicate the presence of medicinal substances introduced into the system by other ways, and can find useful applications in fields of legal medicine and ocular pathology. (Bibliography, 4 figures.)

M. Lombardo.

Borioni, Domenico. Folliculin in the treatment of gonococcic conjunctivitis. *Boll. d'Ocul.*, 1938, v. 17, Sept., pp. 776-784.

The satisfactory use of folliculin by instillation and by mouth in ten newborn and a girl of eight years affected by gonococcic conjunctivitis is reported. The writer admits that folliculin cannot replace silver therapy (argyrol), but the hormone can be given internally to the debilitated new-born while the silver preparation is used locally. (Bibliography.)

M. Lombardo.

Cavallacci, Giulio. Gold therapy in trachoma. *Arch. di Ottal.*, 1938, v. 45, Nov.-Dec., p. 313.

The gold salt known as solganol B, suspended in oil, was used in the treatment of trachoma. On the basis of experiments previously done, this gold salt was found to diffuse easily into the globe and adnexa with very little toxic or general reaction. The experiments were carried out locally by instillation, and generally by intramuscular injection. Instillation therapy was used only in cases of early trachoma without corneal complications. A 2-percent solution of solganol B was used three times a day and increased up to 20 percent. The author concluded that the local treatment did not improve the trachomatous condition or consequent complications.

In intramuscular treatments, sol-

ganol B was used in doses of gr. 0.002 up to gr. 0.2. Two injections per week were given. In one group of cases a mydriatic was used and the solganol given intramuscularly; in another group of cases local therapy was given plus the solganol therapy. The author concluded that in those cases which were given only gold therapy by intramuscular injection, no appreciable benefit was obtained; but with local therapy plus intramuscular gold therapy, there appeared to be a better resolution of ocular complications, particularly in long-standing and rebellious cases. H. D. Scarney.

Cornet, Emmanuel. Optical iridectomies in the trachomatous. Prevention of postoperative pannus. *Revue Internat. du Trachome*, 1939, v. 16, Jan., p. 48. (See Section 7, Uveal tract, sympathetic disease, and aqueous humor.)

Czukrász, Ida. Contribution to the local hyperthermic treatment of ophthalmoblennorrhea. *Klin. M. f. Augenh.*, 1939, v. 102, April, p. 512.

Six cases are reported in which warm irrigations promoted disappearance of the secretion and of the gonococci, abbreviated the healing process, and had a good influence on the corneal complications. C. Zimmermann.

Czukrász, Ida. A case of primary lues in the superior fornix. *Brit. Jour. Ophth.*, 1939, v. 23, May, pp. 347-350.

A forty-year-old physician, into whose right eye a patient with mucous patches had coughed a month previously, developed swelling of the lids, edema and injection, and painful enlargement of the preauricular lymph glands. No local defect in the conjunctiva was found, but two weeks later the Wassermann was reported positive. Under antiluetic treatment, the condi-

tion healed completely without scarring. Apparently the spirochetes can penetrate the loose epithelium of the conjunctiva without lesions being present. D. F. Harbridge.

Kholina, A., and Chernobilskaja, P. The conjunctival flora of the newborn, and its response to agents used for the prophylaxis of gonorrhea. *Viestnik Ophth.*, 1939, v. 14, pt. 1, p. 54.

This laboratory investigation of the conjunctival flora of the newborn and the vaginal secretion of the mother indicates that the vaginal secretion infects the eyes of the fetus before birth. One-percent silver nitrate, the standard prophylactic agent against gonorrhea, in 50 percent of cases irritates the conjunctiva of the newborn. There is practically no difference in the effectiveness and irritating effect of silver nitrate and protargol. The investigation brings out the need for research for a bactericidal but non-irritating substance.

Ray K. Daily.

Lehrfeld, L., and Miller, J. Additional research on vernal conjunctivitis. *Arch. of Ophth.*, 1939, v. 21, April, pp. 639-646.

Heredity is an important factor in vernal conjunctivitis since 40 out of the 120 patients studied gave a family history of allergy. This is comparable with other forms of atopy. The similarity between vernal conjunctivitis and other atopic diseases is striking: there is a definite seasonal incidence, the age group and sex incidence correspond to those found in other atopic states, and a large proportion give positive intradermal and ophthalmic reactions to pollens and other antigens. Eosinophilia is present in the blood and in the ocular discharge. There is a specific local hypersensitiveness of the conjunctiva

without constitutional reactions. Epinephrine hydrochloride instilled locally gives temporary relief.

J. Hewitt Judd.

Luzsa, Andreas. The treatment of trachoma with trachocid. *Klin. M. f. Augenh.*, 1939, v. 102, April, p. 507.

The enthusiastic report of Keppich and of Brecher and Lobel on the therapeutic value of trachocid in trachoma induced the author to try this form of treatment. His use of it on 25 patients was without the least success.

C. Zimmermann.

Marcus, I. M., and Katznelson, A. B. Cytologic studies in phlyctenular (tuberculous-allergy) diseases. *Viestnik Ophth.*, 1939, v. 14, pts. 2-3, p. 80.

A study of 200 cases leads to the following conclusions: Characteristic of the cytologic picture are a pronounced histiocytosis and a less-marked eosinophilia; these findings are most pronounced in cases with inflammatory conjunctival symptoms; and there is a parallelism between the acuteness of the inflammatory symptoms and the cytologic picture. The cytologic reaction takes place during allergic exacerbations. The experimental cytologic picture in rabbits is that of a pronounced eosinophilia and moderate monocyte-histiocytosis.

Ray K. Daily.

Neher, E. M. A new method for transplanting pterygium. *Arch. of Ophth.*, 1939, v. 21, Jan., pp. 30-32; also *Trans. Amer. Ophth. Soc.*, 1938, v. 36, p. 163.

The author states that transplantation of the entire pterygium beneath the upper bulbar conjunctiva has not previously been described. He portrays his own operative technique and points out the merits and advantages that it

possesses over other operative methods. (Discussion.) J. Hewitt Judd.

Pöstić, Svetozar. The importance of the Weil-Félix reaction in trachoma and its bearing on the rickettsian etiology of trachoma. *Revue Internat. du Trachome*, 1939, v. 16, Jan., p. 31. (See *Amer. Jour. Ophth.*, 1939, v. 22, p. 217.)

Pöstić, Svetozar. Remarks on the address by Cuénod and Nataf. Bacteriologic and experimental investigations on the etiology of trachoma. *Klin. M. f. Augenh.*, 1939, v. 102, April, p. 506.

In 75 of 100 cases of trachoma Pöstić found a positive Weil-Félix reaction if the trachomatous process was still florid. The serologic reactions of Weil-Félix were negative in rabbits which had been injected intraperitoneally with abraded trachomatous material.

C. Zimmermann.

Puscariu, E., and Triandaf, E. Trachoma contagion, especially in the adult. *Revue Internat. du Trachome*, 1939, v. 16, Jan., p. 24.

Opinion varies widely between many authors with regard to the communicability of trachoma in the adult. In this study of trachoma in Rumania, 945 out of 1,861 cases were proved to be adult infection. Particularly significant was the finding of 293 new cases in the army.

J. Wesley McKinney.

Rachevskii, F. A. Biochemical data in trachoma. *Viestnik Ophth.*, 1939, v. 14, pt. 1, p. 110.

Studies on 24 trachoma and 24 control patients show no deviation from the normal in the calcium and potassium content, the dry residue of serum, the albumen globulin coefficient of serum, and the blood-sugar curve.

Ray K. Daily.

Radzichovskii, L. B. Suction in the treatment of trachoma. *Viestnik Opht.*, 1939, v. 14, pt. 1, p. 112.

The author aspirates the trachoma follicles by means of a suction tube, and on the basis of his experience with 63 cases he considers this procedure less traumatizing than expression.

Ray K. Daily.

Richards, P., Forster, W. G., and Thygeson, P. Treatment of trachoma with sulphanilamide. *Arch. of Opht.*, 1939, v. 21, April, pp. 577-580.

The results of treatment of twelve Indian children, all showing active trachoma with follicular hypertrophy and pannus, are recorded and tabulated. All showed marked improvement and at the end of 4½ months the conjunctiva in each instance had become follicle-free and smooth. There was a disappearance of corneal infiltrates and an apparent arrest of corneal activity in all but one eye. Two untreated children used as controls showed no improvement during the period of observation but improved rapidly when sulphanilamide therapy was instituted. This treatment caused a disappearance of the epithelial cell inclusion bodies.

J. Hewitt Judd.

Rosenzweig, M. G. Transplantation of cadaver conjunctiva. *Viestnik Opht.*, 1939, v. 14, pts. 2-3, p. 26.

Nine case reports illustrate the usefulness of cadaver conjunctiva for plastic and therapeutic purposes. Twelve days was the longest period of preservation. Difference in blood type and sex between the host and donor is of no significance. Cadaver blood is a good medium for preservation of the conjunctiva.

Ray K. Daily.

Rötth, A. de. Common wart as an etiologic factor in certain cases of con-

junctivitis and keratitis. *Arch. of Opht.*, 1939, v. 21, March, pp. 409-420.

Ocular disease caused by the common wart of the eyelid was first described by the author six years ago (*Amer. Jour. Opht.*, 1933, v. 16, p. 1029). He now reports seven cases of unilateral conjunctivitis, mostly subacute, and three cases of keratitis which were observed in connection with warts of the eyelid. One case of bilateral conjunctivitis is reported in which warts were present on the lids of both eyes. The author considers the following features: virus of the wart as the etiologic factor because of the analogy to molluscum conjunctivitis, unilaterality, superficial involvement, resistance to the usual treatment, and quick recovery after the removal of the wart. It is suggested that any inclusion diseases of the skin may attack the eye.

J. Hewitt Judd.

Spadavecchia, V. Critical exposition of the present state of the etiology of trachoma with especial consideration of the Prowazek bodies and of the rickettsia. *Ann. di Ottal.*, 1939, v. 67, Jan., p. 1.

The author reviews the various theories and laboratory experiments that have been contributed up to the present time on the etiology of trachoma. No organism has been discovered that meets the scientific requirements as a causative agent, nor have those holding the theory that the disease is the product of a filtrable virus succeeded in producing an immunizing vaccine. The article has an extensive bibliography.

Park Lewis.

Stocker, F. A pigmented corneal line in pterygium. *Klin. M. f. Augenh.*, 1939, v. 102, March, p. 384.

Two men of 47 years affected with pterygium showed near the apex of the

pterygium under the epithelium in the clear cornea a firm line consisting of pigment dots. This line did not reach the limbus, and was at right angles to the less-refracting, flattened meridian. After operative removal of the pterygium the line disappeared. Vogt proved anatomically that the senile corneal line is caused by rupture of Bowman's membrane. That the line does not appear in all cases of pterygium is ascribed to the fact that flattening of the cornea occurs only in cases in which the pterygium encroaches upon the cornea with a wide head.

C. Zimmermann.

Suurküla, J. Evaluation of bacteriologic findings in conjunctival inflammations. *Ophthalmologica*, 1939, v. 97, April, p. 20.

Investigations of the author as well as those of others have shown that the bacterial flora of the normal conjunctiva does not differ from that of the inflamed conjunctiva. Microscopic study of smears made from exudate and from epithelial scrapings did not give sufficient information to make an etiologic diagnosis. This was determined with a greater degree of probability when biologic studies were made of organisms obtained by culture from the conjunctiva. F. Herbert Haessler.

Thygeson, Phillips. Cultivation of trachomatous conjunctival epithelium in vitro. *Arch. of Ophth.*, 1939, v. 21, Feb., pp. 229-234.

Trachomatous conjunctival epithelium was found to proliferate in vitro almost as readily as normal conjunctival tissue, the histologic appearance differing in no way from that observed in cultures of normal epithelium. The trachoma virus failed to multiply or even to survive under conditions which enabled abundant growth of its normal

host cells, evidence of its extreme fastidiousness in the matter of growth requirements. Since, in general, viruses require cells having an active metabolism for their multiplication, and since rickettsias grow best in cells which have become stabilized and in which utilization of oxygen has almost ceased, the relationship of the trachoma virus to the rickettsias may soon be known. The author feels that the proper growth conditions for the trachoma virus will ultimately be found.

J. Hewitt Judd.

Thygeson, Phillips. Cultivation in vitro of human conjunctival and corneal epithelium. *Amer. Jour. Ophth.*, 1939, v. 22, June, pp. 649-654; also *Trans. Amer. Ophth. Soc.*, 1938, v. 36, p. 199.

Trapesontzewa, C. As to the "Rickettsia" of trachoma. *Revue Internat. du Trachome*, 1939, v. 16, Jan., p. 40. (See *Amer. Jour. Ophth.*, 1939, p. 218.)

6

CORNEA AND SCLERA

Allende, F. P. Observations on varicose veins of the conjunctiva, corneal ulcer, corneal leucoma (tattooing), and astigmatism. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, Sept., p. 492. (See Section 5, Conjunctiva.)

Ballantyne, A. J. Punctate and ring-shaped corneal degeneration. *Ophthalmologica*, 1939, v. 96, March, p. 346.

A few months ago Kraupa (see *Amer. Jour. Ophth.*, 1939, v. 22, p. 323) published an observation of this condition under the impression that it had not been previously described. Ballantyne points to several earlier references but states that the histology still requires elucidation.

F. Herbert Haessler.

Berardi, M., and Motolese, A. Hereditary familial corneal dystrophy with relapsing dysepithelization. *Boll. d'Ocul.*, 1938, v. 17, Sept., pp. 711-728.

In a family of 26 members, nine of the fourteen who came under observation had corneal lesions. The corneae appeared to have a bluish-grey discoloration and numerous opacities of different shapes were seen. The opacities divided dichotomously from the center of the cornea to 1 mm. from the limbus, running under the epithelium or in the superficial layers of the stroma. They were thought to be nerve filaments. The entire picture was interpreted as a nervous dystrophy which provoked loss of epithelium. (Bibliography, 4 figures.) M. Lombardo.

Biernacka-Biesiekierska, Jadwiga. Studies on the form of the cornea. *Klinika Oczna*, 1938, v. 16, pt. 6, p. 732.

In this fourth article on the structure of the cornea the author believes to have demonstrated a close relation between asymmetry in prominence of the eyeballs, refraction, the diameter of the eyeballs, and corneal radius. Tabulated data show the frequency of asymmetry in the two eyes relative to these factors. The conclusions are that hyperopic eyeballs have a tendency towards symmetry, while myopia tends to be associated with asymmetry in the factors investigated. Ray K. Daily.

Bochever, E. M. Intrasccleral cysts. *Viestnik Ophth.*, 1939, v. 14, pt. 4, p. 66.

A report of two traumatic cases. In one the intrasccleral cyst developed in a postoperative cicatrix, the primary operation having been performed for the excision of a congenital iris cyst. The walls of the excised cyst were lined with numerous layers of corneal epithelial cells. The other case developed

subsequent to a perforating ocular injury; because the eye was blind it was enucleated. The cyst was lined with conjunctival epithelium, stratified in some places, and consisting of one or two layers in others. Ray K. Daily.

Cornet, Emmanuel, Trachomatous corneal vascularization. Its clinical value. *Revue Internat. du Trachome*, 1939, v. 16, Jan., p. 1.

The author describes the different forms of corneal vascularization which may occur in the course of trachoma. He considers pannus to be a reparative process in response to loss or excess of tissue. Interstitial vascularization may be due to trachoma itself or to an associated syphilitic or tuberculous process. Clinical forms are cited.

J. Wesley McKinney.

Dalsgaard-Nielsen, Esther. On the acuity of vision and the causes of impairment of vision in patients with past syphilitic interstitial keratitis. *Acta Ophth.*, 1939, v. 17, pt. 1, p. 43.

A review of the literature and a very detailed analysis of the author's own material which consisted of 214 eyes. The visual acuity was 6/6 to 6/18 in 75 percent, 6/24 to 6/60 in 11 percent, less than 6/60 in 8 percent, and blindness in 6 percent. In addition to the corneal sequelae of parenchymatous keratitis, factors in visual impairment were iridocyclitis, glaucoma, cataract, and choroiditis. Ray K. Daily.

Dalsgaard-Nielsen, Esther. On the recurrence of syphilitic interstitial keratitis. *Acta Ophth.*, 1939, v. 17, pt. 1, p. 38.

On the reëxamination of 173 patients the author failed to find a true recurrence of keratitis. She believes that most reported recurrences are errors in diagnosis and she cites two cases of

recurrent iridocyclitis which but for a careful study of the corneal precipitates might have been diagnosed as a recurrence of parenchymatous keratitis.

Ray K. Daily.

Dalsgaard-Nielsen, E., and Osterberg, G. *Ulcus rodens Mooren*. *Acta Ophth.*, 1939, v. 17, pt. 1, p. 28.

A review of the literature and a report of two cases. In one patient, a woman 52 years old, the involvement was unilateral and ended in enucleation. In the other, a woman 57 years old, the disease was bilateral. The microscopic sections of the enucleated eye revealed profound vascular changes in and behind the ulcer, as well as on the opposite side, and indicate that the corneal disease is secondary to pericorneal vascular disturbances. (Illustrations.)

Ray K. Daily.

Davidson, M. *Occupational keratitides and corneal dystrophies*. *Arch. of Ophth.*, 1939, v. 21, April, pp. 673-683.

Occupational superficial punctate keratitis and dystrophy are often diagnosed as subacute or chronic conjunctivitis and as band-shaped keratitis, and the true nature of the conditions is overlooked without the use of the slit-lamp. Three types of this form of keratitis may be recognized. The first is an acute or subacute occupational superficial punctate keratitis, apparently due to particulate matter in spraying processes which clings to the corneal epithelium, rather than to gases. The second is a chronic occupational superficial punctate keratitis verging on a dystrophy and apparently due to hard and sharp spicules penetrating the cornea, such as silica or metals. This type is more important because of the hypesthesia, but is not common and is seen only among the older workers, be-

ing principally due to exposures in the presafety era. The third type is an occupational band-shaped keratitis seen in the form of a post-traumatic lime band. Medicolegally, an interval of from one to five days is to be considered a requisite for a causal relation between a corneal injury and a herpetic corneal disease. The problem of prevention of occupational keratitides and dystrophies is essentially one of safety engineering. J. Hewitt Judd.

Duc, Camillo. *Avitaminosis A*. *Rassegna Ital. d'Ottal.*, 1938, v. 7, Nov.-Dec., p. 791.

Duc reviews the literature on vitamin A and the disturbances caused by its deficiency. He reports two cases occurring in improperly-fed babies of two months. In the first case there was bilateral keratomalacia with necrosis of one cornea. The second baby also presented keratomalacia but died on the eleventh day of treatment. (One figure.) Eugene M. Blake.

Feigenbaum, Aryeh. *Note on epidemic superficial punctate keratitis in Palestine*. *Revue Internat. du Trachome*, 1939, v. 16, Jan., p. 18.

The author reports eight cases of this disease, an affection which occurs in many tropical and subtropical countries particularly during the rainy season. It is a virus disease as shown by inoculations of corneal scrapings. Three of the cases were thought to be acute trachoma.

J. Wesley McKinney.

Grancini, Enrico. *An exceptional case of severe ulcer rodens corneae in a young subject which manifested itself consecutively and symmetrically also in the other eye*. *Boll. d'Ocul.*, 1938, v. 17, Aug., pp. 645-662.

A young man of twenty years, after being struck in the left eye by the tail of an ox, developed a corneal ulcer which by its course and appearance was diagnosed as a rodent ulcer. It resisted the usual forms of treatment, and healed only after a Kuhnt keratoconjunctival plastic was performed. A few months later the patient, without any evident cause, developed the same type of ulcer on the right cornea. Its progress was stopped after the same plastic was performed. A good amount of vision was saved in this eye and it was later improved by the use of subconjunctival injections of a hypertonic solution of NaCl. Pterygium-like growths were trimmed off. The writer emphasizes the satisfactory and effective result obtained by the surgical procedure used in these cases, and although microscopic and cultural researches revealed the presence of a bacterium identified as a streptothrix, he concludes that such a lesion has to be considered of neurotrophic rather than of bacteriologic origin. (Bibliography.)

M. Lombardo.

Graves, Basil. Bilateral mesial superficial "deficiency" of the sclera (scleral plaques). *Brit. Jour. Ophth.*, 1939, v. 23, March, pp. 191-204.

This article was written prior to the appearance of one by Culler on the same subject (*Amer. Jour. Ophth.*, 1939, v. 22, p. 457), and is now published as originally written, but with the insertion of comments on Culler's article. Congenital aspects of the condition are mentioned, but the bulk of the article concerns corneal changes found in association with the scleral condition. Certain highly refractile droplets in the substance of the cornea adjacent to the scleral plaque are interpreted as being degenerative products, and suggest that

the associated scleral defect may represent a hyaline degeneration. (Illustrations.)

D. F. Harbridge.

Gundersen, Trygve. Vascular obliteration for various types of keratitis; its significance regarding nutrition of corneal epithelium. *Arch. of Ophth.*, 1939, v. 21, Jan., pp. 76-105; also *Trans. Sec. on Ophth., Amer. Med. Assoc.*, 1938, 89th mtg., p. 94.

The effect of interrupting blood vessels at the limbus was observed in 36 cases including eight different groups of various types of keratitis associated with vascularization of the cornea. The cases are reported in detail, the areas cauterized and the effect on the blood vessels being shown by means of diagrams. Considering the chronic nature of the disease in each case, the results were good and leave no doubt that peritomy is of great value in certain corneal conditions. The assumption that the newly formed blood vessels cause and maintain the reactivation of the lesions explains the results obtained in these cases. Corneal blood vessels may cause not only opacification, but necrosis and an actual increase in the amount of corneal infiltration. Obliteration of the pericorneal blood vessels is particularly valuable in metaherpetic ulcers since they are probably due to a nutritional disturbance or to some noxious substance brought to the cornea by the abnormal blood vessels. The so-called wandering phlyctenule of the cornea is not always tuberculous in origin as a similar condition may result from herpes corneae and other causes. Complete peritomy does not cause any visible disturbance in the corneal epithelium. Almost all of the pericorneal blood supply can be excluded without harmful effect. In view of this fact and other experimental evidence, and since

the tears are rich in sugar and nitrogenous substance, it is probable that the epithelium derives its nutrients chiefly from tears and utilizes oxygen directly from the surrounding air. (Discussion.)

J. Hewitt Judd.

Kamenetzskaja, Z. The effect of the age of the donor on the fate of the transplant. *Viestnik Opht.*, 1939, v. 16, pt. 4, p. 71.

A report of five cases in which the preserved cornea of the cadaver was used with very good results. The age of the donors varied from fifty to seventy years.

Ray K. Daily.

Lagomarsino, Alice. Bee poison in the treatment of trachoma. *Ann. di Ottal.*, 1939, v. 67, Feb., p. 143.

The absence of exact knowledge of the pathogenesis of trachoma has warranted the employment of empirical methods of treatment. The poison of the honey bee has been used for various purposes. The author describes the method of obtaining the poison from the bee, its physiologic action and biology, and reports eighteen cases of trachoma treated by this method. From the first instillation improvement was noted, with healing of the ulcer and regression of the pannus. The eyes were tolerant to treatment. (Bibliography.)

Park Lewis.

Löscher, H. Treatment of acne rosacea of the cornea. *Klin. M. f. Augenh.*, 1939, v. 102, March, p. 392.

Four cases are reported cured by subcutaneous 1-c.c. injections of cortidyn (an extract of adrenal cortex) every two days, and simultaneous oral doses of two tablets daily.

C. Zimmermann.

McKee, S. H. Treatment of serpiginous ulcer of the cornea with methyl

salicylate. *Arch. of Ophth.*, 1939, v. 21, Jan., pp. 121-123.

This treatment, which is used empirically, has proved very satisfactory in certain cases of serpiginous ulcers. It avoids the dense scars produced by actual cautery. According to the author's method, after instillation of a local anesthetic, the ulcerated area is thoroughly dried and the oil rubbed well into the ulcer with a round-ended wood applicator, the surrounding area being kept dry. After two or three minutes the eye is bandaged, and the patient put to bed. Five typical cases are reported in detail to show the variation in response.

J. Hewitt Judd.

Mikaelian, P. X., and Privalskii, E. I. Small-pox immunity of the cornea in stimulation of the upper cervical sympathetic ganglion. *Viestnik Opht.*, 1939, v. 14, pt. 1, p. 39.

The objective of this laboratory investigation was the demonstration of the relation of small-pox immunity to the vegetative nervous system. The protocols of the experiments showed a greater immunity in rabbits in which the superior cervical ganglion had been traumatized fifteen days previously to the corneal vaccination.

Ray K. Daily.

Mitzkevich, L. D. A complication in subconjunctival implantation of auricular cartilage for trachomatous pannus. *Viestnik Opht.*, 1939, v. 14, pt. 1, p. 118.

Six weeks after this operation the patient returned with an atheromatous cyst. The author cautions against inclusion of skin in the cartilage transplant.

Ray K. Daily.

Oreste, Alfredo. Fascicular keratitis. *Boll. d'Ocul.*, 1938, v. 17, July, pp. 593-595.

Darier has called guaiacol a true specific for ocular tuberculosis. For fascicular keratitis the writer incorporates two drops of synthetic guaiacol in ten grams of 1 or 2-percent yellow oxide of mercury salve. The application of the salve two or three times a day in the conjunctival sac with the usual massage is followed by a beneficial analgesia, and in a few days all the irritative symptoms are decreased, the progressive margin of the ulcer is stopped, and the blood vessels disappear. Subconjunctival injection of a few drops of 2-percent guaiacol is suggested in severe cases. M. Lombardo.

Rötth, A. de. Common wart as an etiologic factor in certain cases of conjunctivitis and keratitis. *Arch. of Ophth.*, 1939, v. 21, March, pp. 409-420. (See Section 5, Conjunctiva.)

Schmidt, Jenö. Technique of keratoplasty. *Klin. M. f. Augenh.*, 1939, v. 102, March, p. 315.

Schmidt adopted the technique devised by Löhlein. Two causes, beside opacities of the transplant, are responsible for failures: postoperative increase of tension, and the formation of a retrocorneal membrane from blood, fibrin, and pieces of tissue lost during operation behind the transplant. In the reported case a retrocorneal membrane developed, discussion of which would probably have improved vision.

C. Zimmermann.

Schwitalla, Helmut. An epidemic of keratoconjunctivitis nummularis (Dimmer). *Klin. M. f. Augenh.*, 1939, v. 102 April, p. 491.

From September to December Schwitalla observed 129 cases all of which grew gradually worse. The typical course consisted of formation of epithelial opacities which developed

into larger discs, indistinctly outlined, and lying in the anterior parenchyma of the cornea. They at no time became ulcerated. Vision was reduced to not more than one-third of normal. Of the 129 cases, 106 were unilateral; 23 were bilateral, but in the beginning all were unilateral, the second eye becoming affected after a few days. The etiology is not known, and the disease takes a more or less undisturbed course.

C. Zimmermann.

Segaller-Miron, M. Diathermy coagulation in the treatment of trachomatous pannus. *Ann. d'Ocul.*, 1939, v. 176, March, pp. 204-212.

The author reports good results in treating trachomatous pannus by diathermy coagulation. There was no damage to the corneal tissue and no undue reaction in the iris or ciliary body. Although there were recurrences in some cases, this method seems superior to the usual surgical approach. Nine cases are reported in detail.

John M. McLean.

Shershevskaja, O. I. Remarks on the technique of corneal transplantation. *Viestnik Opht.*, 1939, v. 14, pt. 1, p. 77.

A description of sutures for fixation of the conjunctival flap covering the transplant. (Illustrations.)

Ray K. Daily.

Sugita, Y. Further observations on the character of the disc or ring-formed corneal opacities in disciform and other forms of keratitis. *Graefe's Arch.*, 1939, v. 140, pt. 1, pp. 141-148.

When strong acid such as sulphuric, nitric, or hydrochloric was rubbed into a wound 1 mm. long in the central part of the corneas of enucleated cattle eyes, disc-shaped corneal opacity similar to that seen in human disciform keratitis always resulted. This experiment in

the enucleated eye would indicate that the disciform keratitis in man may be concerned with cell function without any participation by cellular infiltration. The disc-shaped opacity in the cornea of the enucleated eye, as also the clinical picture of disciform keratitis, may be due to the diffusion of the cleavage products of albumen and other substances to form a ring of precipitation of stromal albumen. Disciform keratitis in the human may therefore be primarily produced by a physicochemical process with secondary wandering in of round cells. In cases where the corneas thus experimented upon were fixed, no opacity remained, proving that the opacity present before fixation must belong to physicochemical factors.

H. D. Lamb.

Suurkula, J. Is rodent ulcer of the cornea to be attributed to a deficiency of vitamin B₁? *Klin. M. f. Augenh.*, 1939, v. 102, April, p. 500.

Improvement of rodent ulcer in a woman of 49 years following thirteen intragluteal injections of betaxin seemed to indicate that rodent ulcer may be due to a trophic disturbance developing from degenerative changes in the corneal nerves secondary to deficiency of vitamin B₁.

C. Zimmermann.

Theodore, F. H. Congenital type of endothelial dystrophy. *Arch. of Ophth.*, 1939, v. 21, April, pp. 626-638.

Three cases of endothelial dystrophy occurring in a young woman of eighteen years, her father, and her grandmother are described. The condition in these cases was apparently of congenital origin. A review of the literature reveals that some authors consider the condition to be congenital, while the great majority believe it to be a senile

degenerative change. On the basis of evidence of some apparent differences noted in the two types, it is suggested that endothelial dystrophy be considered as having two forms, one congenital and the other senile.

J. Hewitt Judd.

Thiel, R. Treatment of acne rosacea with extract of the cortex of adrenal glands. *Klin. M. f. Augenh.*, 1939, v. 102, March, p. 394.

Thiel had favorable results in ten cases (of which two are reported in detail) with injections of a preparation of extract from the cortex of the adrenal glands. No deleterious action was observed.

C. Zimmermann.

Thygeson, Phillips. Cultivation in vitro of human conjunctival and corneal epithelium. *Amer. Jour. Ophth.*, 1939, v. 22, June, pp. 649-654; also *Trans. Amer. Ophth. Soc.*, 1938, v. 36, p. 199.

Tikhomirov, P. E. The effect of carotin on infected and noninfected corneal wounds. *Viestnik Opht.*, 1939, v. 14, pt. 4, p. 55.

A laboratory study on rabbits showing that locally carotin hastens healing of noninfected wounds, but has no effect on infected wounds.

Ray K. Daily.

Tooker, C. W. Metastatic septic endophthalmitis with ring abscess of the cornea. *Amer. Jour. Ophth.*, 1939, v. 22, May, pp. 526-535; also *Trans. Amer. Ophth. Soc.*, 1938, v. 36, p. 77.

Wasserman, I. A. Transplantation of cadaver cornea. *Viestnik Opht.*, 1939, v. 14, pts. 2-3, p. 10.

The conclusions are that cadaver cornea is the most suitable transplantation material. Transparent transplants were obtained in 58 percent of the cases,

while in transplants from the living the percentage was between 20 and 28. Transparent transplants were obtained from cornea preserved for from one to three days; in two cases the cornea was kept 8½ days. In cadaver corneal transplants the blood vessels enter in fewer numbers and become obliterated more rapidly than in transplants from the living.

Ray K. Daily.

Zur Nedden. *Keratitis superficialis punctata*. *Klin. M. f. Augenh.*, 1939, v. 102, April, p. 487.

Supplementing his previous article on an epidemic of superficial punctate keratitis (*Amer. Jour. Ophth.*, 1939, v. 22, Feb., p. 223), the author has now observed 200 cases altogether. Only adults are affected. The etiologic factor may be any mechanical, thermal, or chemical irritation of the conjunctiva. It is suggested that the infection is by a still unknown virus. Some success was obtained by the use of a solution of iodine 0.1, iodide of potash 1.00, and water 100 in healing serpent ulcers not larger than 2 mm.

C. Zimmermann.

7

UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Antoniotti, Filippo. The behavior of the pupil in cases of chronic appendicitis. *Rassegna Ital. d'Ottal.*, 1938, v. 7, Nov.-Dec., p. 762.

Antoniotti discusses the maladies outside the eye which may cause pupillary inequality, and then relates the results of his observations in 100 cases of chronic appendicitis. He states that dilatation of the right pupil is a precocious sign of chronic inflammation of the appendix and is valuable in differentiating diseases in the iliac fossa. The sign was positive in 80 percent of

his cases. The test should be made in a moderately diffuse light.

Eugene M. Blake.

Bertoldi, Maria. *Heterochromia iridis, cyclitis, and cataract*. *Rassegna Ital. d'Ottal.*, 1938, v. 7, Nov.-Dec., p. 738.

Bertoldi presents a very good review of our knowledge of heterochromia iridis and then describes such a case occurring in a man of 29 years. There had always been a fairly marked difference in the color of the two irides and later cyclitis and cataract formation appeared. The author postulates a congenital defect of the mesodermal pigment layer of one eye and a concomitant slight asymmetry of sympathetic nervous control. The development of a mild pulmonary tuberculosis, proved by X ray and skin reaction, was enough to incite the cyclitis and secondary cataract. Intraocular tension was normal. (One figure.) Eugene M. Blake.

Cohen, Martin. *Diseases of the choroid*. *Arch. of Ophth.*, 1939, v. 21, March, pp. 522-526.

This review includes a brief summary of the anatomic structure and function of the choroid. Acute choroiditis is usually the result of local trauma or of a metastatic focus. Chronic choroiditis is usually the result of an acute choroiditis, although the condition may be due to various systemic diseases of a chronic nature, such as syphilis, tuberculosis, diabetes, and blood dyscrasias. Myopic changes and tumors are also briefly discussed.

J. Hewitt Judd.

Cornet, Emmanuel. *Optical iridec-tomies in the trachomatous*. Prevention of postoperative pannus. *Revue Internat. du Trachome*, 1939, v. 16, Jan., p. 48.

Reference is made to the corneal vascularization which often occurs after trauma in trachoma. This can be a particularly discouraging and unforeseeable complication in the only clear area following an optical iridectomy. In an attempt to avoid such vascularization the author routinely injects mercury cyanide subconjunctivally. J. Wesley McKinney.

Ellett, E. C. (a) Leiomyoma and (b) hematoma of the iris. *Arch. of Ophth.*, 1939, v. 21, March, pp. 497-504; also *Trans. Amer. Ophth. Soc.*, 1938, v. 36, p. 98. (See Section 15, Tumors.)

Gasteiger, H. An operation for iridodialysis with remarks on a peculiar origin of this condition. *Klin. M. f. Augenh.*, 1939, v. 102, April, p. 537.

During an extracapsular extraction of cataract in a woman of 76 years the iris adhered to the lens and was pulled out. There were no synechiae and the iris had not been grasped by the forceps. The iris was then detached from the lens and cut in the form of a total iridectomy. Sixteen days later a conjunctival flap was prepared and two incisions with a lance-shaped knife were made at the limbus; the iris was drawn into the wound at both places and the conjunctiva sewed. A week later the iris was drawn into a new incision and there fixed with good result. The case shows that extensive dialyses can be healed by operation.

C. Zimmermann.

Hallermann, Wilhelm. Operative treatment of tuberculous iridocyclitis. *Klin. M. f. Augenh.*, 1939, v. 102, March, p. 318.

Observations on the large number of patients at Hohenschwand (1,350) gave ample opportunity for evaluating

results of iridectomy in tuberculous iridocyclitis, which proved to be very poor. The results of transfixion as devised by E. Fuchs were very satisfactory, as shown in eighteen recent cases. It is necessary that the fibers of the iris be severed at right angles to their course. C. Zimmermann.

Heath, Christopher. Solitary retinochoroiditis with reference to retinochoroiditis juxtapapillaris, Jensen. *Brit. Jour. Ophth.*, 1939, v. 23, May, pp. 289-330.

The author considers that the subject under discussion has had both inadequate and inaccurate notice in the literature. Since the disease is not a rare one, it is felt that a review of the literature and an investigation of numerous cases would assist in clarifying present views. Twenty-four cases (ten male and fourteen female) are summarized as to findings under the following headings: type of patient, general health, tests, incidence, macular involvement, papillary changes, keratitic precipitates, vitreous changes, and pain. The patients were of a class in which a high incidence of tuberculosis would not ordinarily be expected. With four exceptions, all were engaged in skilled trades. Various types of visual-field defects are discussed, and the apparently high incidence of the disease in childhood is indicated. (Figures, bibliography.)

D. F. Harbridge.

Hodgson, T. H. Studies on the aqueous humor in normal and glaucomatous eyes. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 87.

Benham, Davson, and Duke-Elder stated in a previous communication (*Amer. Jour. Ophth.*, 1938, v. 21, p. 704) that the osmotic pressure of serum

was greater than that of aqueous humor by an amount compatible with the formation of the latter by dialysis. As a result of further experiments, performed by Hodgson in collaboration with Benham and Duke-Elder, Hodgson now revises the above statement. The experimental work was undertaken to determine whether the fact that animal experiments had been done under general anesthesia had any bearing on the results. Dogs were trained to permit withdrawal of aqueous humor under local anesthesia, and it was found that the molar concentration of the aqueous was higher than that of the blood. Under ether anesthesia the osmotic pressure of the blood increased by an amount sufficient to reverse this relationship. These findings lead the authors to believe that the aqueous is not a dialysate. Beulah Cushman.

Kaminskaja-Pavlova, Z. A. The relation between intraocular tension and pupillary reaction to pain. *Viestnik Opht.*, 1939, v. 14, pt. 4, p. 29. (See Section 8, Glaucoma and ocular tension.)

Muncaster, S. B., and Allen, H. E. Bilateral uveitis and retinal periarteritis as a focal reaction to the tuberculin test. *Arch. of Ophth.*, 1939, v. 21, March, pp. 509-511.

A young woman aged 31 years was given 0.00002 mg. of purified protein derivative (Mulford). There was no reaction after 48 hours when another injection of 0.005 mg. was given. After four hours both the first and the second test areas became inflamed, and ten days later both eyes were involved with a marked uveitis which gradually subsided. The corrected vision returned to normal after three months

but there were remnants of the retinal exudate along the larger arteries.

J. Hewitt Judd.

Samoilov, A. T., and Asarova, H. C. An attempt at a clinical classification of tuberculous choroiditis. *Viestnik Opht.*, 1939, v. 14, pt. 4, p. 33.

The author classifies tuberculous choroiditis as exudative and hemorrhagic, each with a characteristic fundus picture, a characteristic focal reaction to tuberculin, and a different clinical course. (Illustrations.)

Ray K. Daily.

Walsh, F. B. Ocular importance of sarcoid; its relation to uveoparotid fever. *Arch. of Ophth.*, 1939, v. 21, March, pp. 421-438.

That uveoparotid fever and sarcoid are closely related diseases with protean ocular manifestations is indicated by a clinical and histologic study of the six cases summarized in this paper. The frequent involvement of ocular tissue, which may be manifested at any time during the course of the disease, makes this symptom complex of particular interest to the ophthalmologist. The cause of these closely allied conditions is not known but it is thought to be tuberculosis. (Photomicrographs, photographs, fundus drawings, field charts.)

J. Hewitt Judd.

Wiegmann, F. A case of unilateral spasm of the intrinsic ocular muscles. *Klin. M. f. Augenh.*, 1939, v. 102, March, p. 391.

A girl of 22 years presented a unilateral spasm of the intrinsic ocular muscles for several days. The condition disappeared after instillations of scopolamine. It was attributed to a disturbance in the ciliary ganglion.

C. Zimmermann.

NEWS ITEMS

Edited by DR. H. ROMMEL HILDRETH

640 S. Kingshighway, Saint Louis

News items should reach the Editor by the twelfth of the month

DEATHS

Dr. Frank Embery, Philadelphia, died March 17, 1939, aged 72 years.

Dr. Frederic Gilbert Ritchie, Queens Village, New York, died March 15, 1939, aged 78 years.

MISCELLANEOUS

American Board of Ophthalmology. Written examination: August 5th, April 6th. Formal application must be received before July 1st for the August examination and before January 1st for the April examination. Oral: Chicago, October 7th; New York City, June 10th. Secretary, Dr. John Green, 6830 Waterman Avenue, Saint Louis, Missouri.

The Advisory Committee on Medicine and Public Health of the New York World's Fair, (members of the Executive Committee) of which are Dr. Louis I. Dublin and Dr. Victor Heiser, appointed a Committee on the Conservation of Vision. Dr. John M. Wheeler was selected as chairman. Upon his death, Dr. Daniel B. Kirby was asked to assume his duties for the organization of the exhibit. The members of the committee are Dr. Conrad Berens; Mr. Lewis H. Carris, National Society for the Prevention of Blindness; Mr. Homer N. Calver, Director of Medical Exhibits, New York World's Fair; Dr. John Evans; Dr. M. E. Frampton, principal, New York Institute for the Education of the Blind; Dr. Bruno Gebhard, technical consultant; Dr. LeGrand Hardy; Miss Grace S. Harper, New York State Commission for the Blind; Mr. M. Julian; Miss Eleanor Mumford, Associate for Nursing Activities; Dr. Webb W. Weeks. The expenses of the exhibit are borne by the sponsor, The New York Institute for the Education of the Blind. The principal of the Institute, Dr. M. E. Frampton, has a broad view of the purposes of the exhibit. He has co-operated to the utmost to portray The Eye in Health and Disease in a graphic way to the lay public who will visit the Hall of Medicine in which the exhibit is housed at the World's Fair.

The origin and development of the eye, its anatomy, physiology, and pathology are portrayed in beautiful, artistic transparencies in color. Twelve illuminated panels with 6 to 10 pictures each, tell the story. The presence of the blind students from the New York Institute brings home in a vivid and striking way the necessity for the program of the preven-

tion of blindness. The members of the committee held numerous meetings and devoted much time individually to the selection of material and to the elaboration of new methods of presentation of a technical subject to a lay public in understandable terms. That success has been achieved is to be judged by the great interest and attendance.

The subjects which are shown are embryology, anatomy, optics, the effect of various diseases and poisons, the results of accidents and their prevention, the effect of inflammation and infections of the eye and general system and their prevention and treatment, cataract, glaucoma, and strabismus.

Coöperating in the production of the transparencies were: The American Board of Ophthalmology, The Eye Surgery Fund, The Institute of Ophthalmology, which contributed part of the art material of G. Bethke, M. Quinlin, and A. Marfaing, The Department of Ophthalmology of The State University of Iowa, The National Society for the Prevention of Blindness, The New York State Commission for the Blind, The Ophthalmology Fund, and the Lighthouse.

The New York Institute for the Education of the Blind through Dr. M. E. Frampton and Mr. Paul Mitchell adopted the purpose of educating the public regarding the normalcy of blind people and the manner of their adjustments to blindness. The spoken word is exemplified by vibration aids in the education of the deaf-blind and symbolized through radio to show vocational possibilities for the sightless. Emphasis is placed on the written word by the use of the Braille machine to convey information from the sighted to the blind and the use of the typewriter to convey it from the blind to the sighted. The progress of the blind in literature, science, mathematics, and in the arts and crafts is exemplified by blind students who exhibit their attainments in brief working periods at the Fair. Along the top of the main wall is the motto "And I Shall Lead The Blind By A Way They Knew Not" with a transcription in enlarged Braille just below the motto, each Braille letter directly below its corresponding printed letter.

The actual presence of the blind in connection with their problems of education and vocational nature must emphasize the need for the prevention of blindness and make for a better understanding of the blind. It will make easier the problem of the eye physician and

those who are associated with him in the care of the eyes of the public.

SOCIETIES

The Advisory Council on Medical Education was created on June 24, 1939, at a meeting in Chicago by 11 national organizations concerned with the training of physicians to meet the present-day needs of medical care for the country. The need for some central representative agency has long been recognized as necessary to make medical training more effective than it has been in its service to the public.

Dr. Willard C. Rappleye, Dean of the Faculty of Medicine of Columbia University, who was elected president, stated that the purpose of the Advisory Council is to correlate the efforts of the universities, medical schools, hospitals, licensing bodies, public health associations, and boards of specialists.

"This organization brings together for the first time the various national bodies dealing with all phases of the training and licensing of physicians beginning with his preparatory college work and including medical education, hospital internship, residency, licensure, and graduate training for specialization. Coöperation and coördination are to be substituted for present overlapping and competing functions of existing agencies."

The organizations represented on the Advisory Council on Medical Education are: Association of American Medical Colleges, American Hospital Association, Catholic Hospital Association, Federation of State Medical Boards of the U.S.A., Advisory Board for Medical Specialties, National Board of Medical Examiners, American College of Physicians, American College of Surgeons, Association of American Universities, American Association for the Advancement of Science, Division of

Medical Science, and the American Public Health Association. Two new organizations were recently elected to membership: American Protestant Hospital Association and the Association of American Colleges.

Among the important problems considered by the Council at its meeting were those of proper educational standards of the hospital internship, adequate training for the specialist, sound programs for the continued education of physicians in practice, modifications in college preparation for medical studies, the simplification of the procedure for licensure in the 48 separate states, and the status of training of graduates of foreign medical schools. Special committees of the Council were appointed to study these various questions.

The following are the officers: Dr. Willard C. Rappleye, Dean of the Faculty of Medicine of Columbia University, president; Dr. Maurice H. Rees, Dean of the School of Medicine of the University of Colorado, vice-president; Dr. Robin C. Buerki, Director of Study of the Commission on Graduate Medical Education, secretary-treasurer. The Executive Committee consists of the officers and the following: Dr. Anton J. Carlson, Professor of Physiology of the University of Chicago; Dr. Harold Rypins, Secretary of the New York State Board of Medical Examiners; Dr. Hugh J. Morgan, Professor of Medicine of Vanderbilt University; Dr. Arthur W. Allen, surgeon, Boston.

PERSONALS

Dr. Arthur Bedell was the guest of the Canadian Medical Association at their annual meeting in Montreal the week of June 19th. He addressed the general meeting on "Retinal changes in arterial hypertension" and also took part in discussion in the special section.

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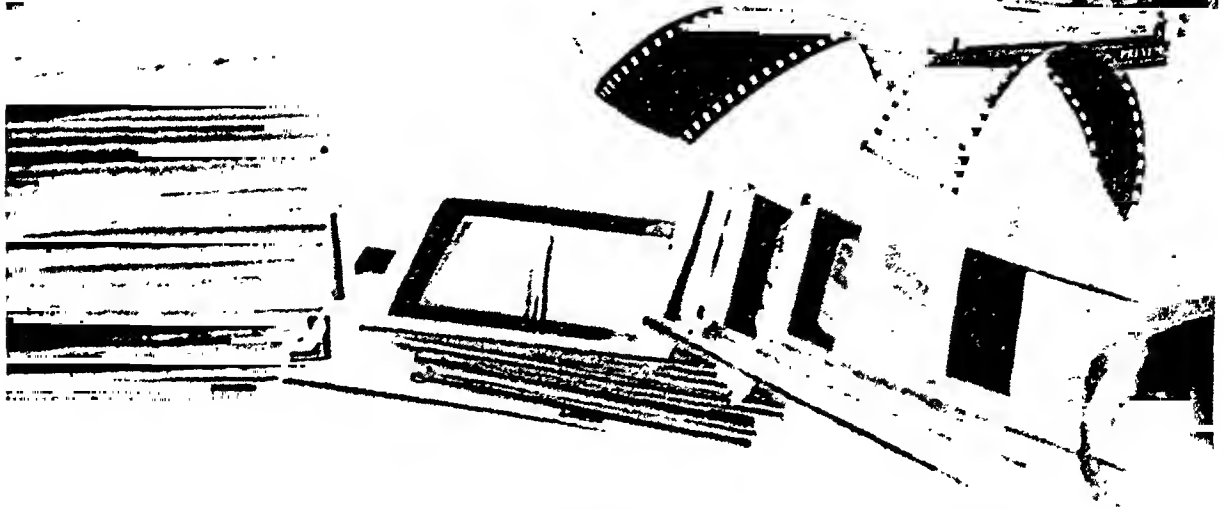
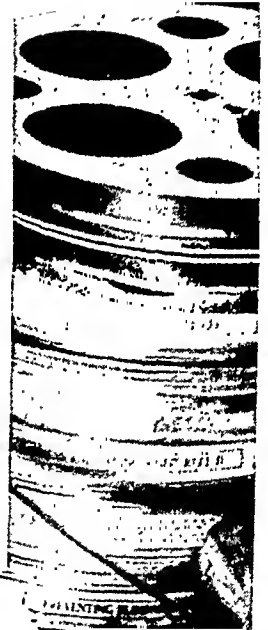
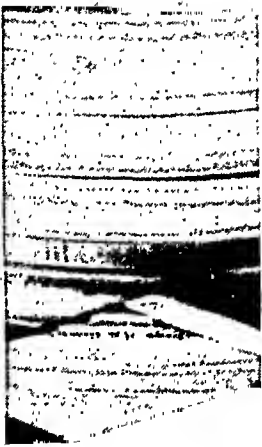
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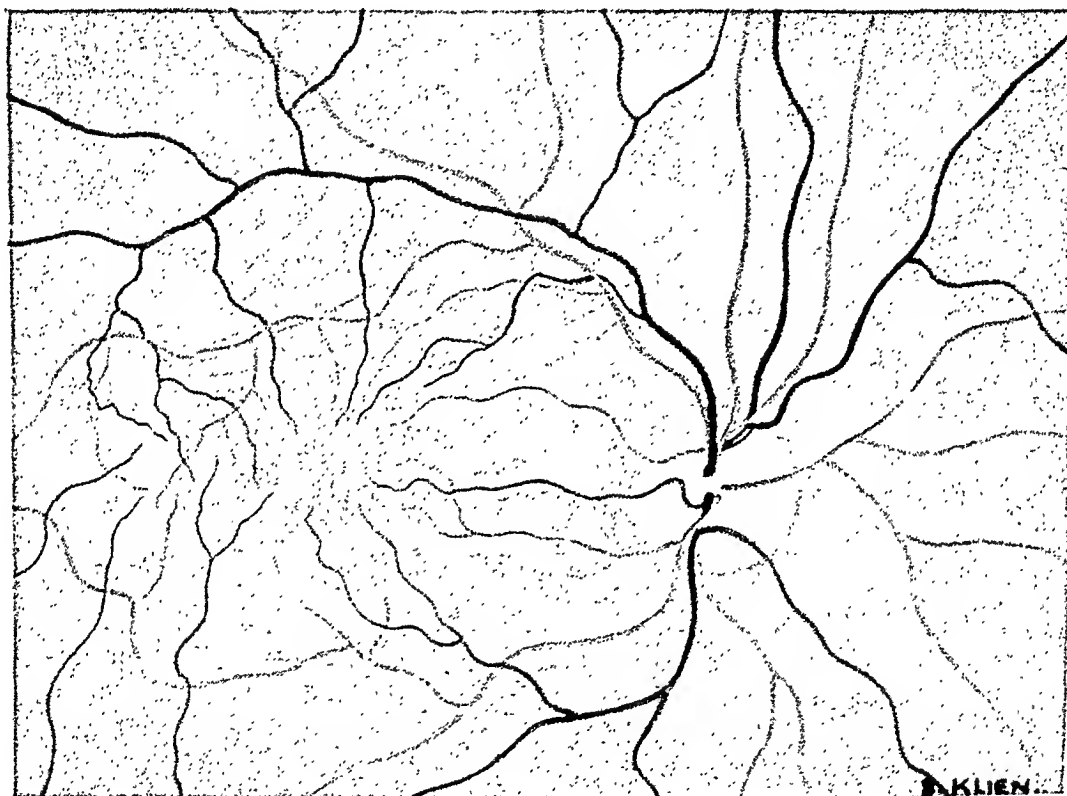


FIG. 1 (KLIEN). FUNDUS IN OGUCHI'S DISEASE

A CASE OF SO-CALLED OGUCHI'S DISEASE IN THE U.S.A.

BERTHA A. KLIEN, M.D.

Chicago

In 1908 Oguchi¹ described a peculiar congenital, stationary night blindness that is associated with a diffuse, grayish-white discoloration of the greater part of the eyegrounds. The white color disappears completely after occlusion of the eyes for several hours, a phenomenon which, after its discoverer, is called Mizuo's phenomenon. In Japan, 27 cases of Oguchi's disease were reported between 1908 and 1924.

The first certain case outside of Japan was reported by R. Scheerer² in Europe in 1927. Since then two reports have been added by Endelmann³ in 1931, one by Bein and Michniewicz⁴ in 1932, and one by Gangstrom⁵ in 1937. Two other cases are mentioned by Fleischer⁶ and Gianini,⁷ making a total of seven cases outside of Japan.

The following account of a case of Oguchi's disease appears to be the first reported in the United States of America, and in the English literature.

CASE REPORT

McC. E., a female, 44 years of age, American born, visited the Eye Clinic of Rush Medical College, complaining of night blindness, which she remembered as being of the same degree since early infancy. The patient knows of no other member of the family who is similarly afflicted. Her parents were of English and Hollandish extraction, and there was no history of consanguinity.

Ocular examination: The corrected

vision was R.E. 0.4, J 2 (+6.00 D. sph. \approx +1.00 D. cyl. ax. 25°); L.E. 0.8-3, J 1 (+4.75 D. sph. \approx + 1.25 D. cyl. ax. 150°). The external findings were normal, with the exception of a somewhat delayed dilatation of the pupils upon sudden reduction of illumination.

Fundi: In both fundi there was a wavy, yellowish-white discoloration, surrounding the discs and maculae, and most intense above and temporal from the maculae, extending well into the periphery (frontispiece), where a gradual transition into normal fundus with distinctly visible choroidal pattern could be observed. This opacity was situated underneath the retinal vessels, which appeared very distinct in all their finest branches against it. There was no pigmentary disturbance anywhere. After occlusion of the eyes for seven hours, this opacity had disappeared completely, leaving an entirely normal fundus.

The peripheral visual fields for form were normal. The central visual fields, taken on an average bright day, revealed a slight enlargement of the blindspots, greater in the right than in the left.

The color vision was tested with the Ishihara charts. The patient was found to be completely red-green blind, and was reading with difficulty also those charts that are easily recognized by the protanopic and deuteranopic, indicating a severe defect also in the blue-yellow perception.

The adaptation time, measured with

Feldman's adaptometer, was 57 minutes as compared to the normal three to five minutes.

The visual acuity was not influenced by the state of adaptation.

During a second occlusion test, the patient's fundi were observed once every hour, for four hours. During this time the progressive failing of the white areas could be stated from hour to hour, until after four hours of occlusion all the opacities excepting a group above and temporal to the maculae, where originally the densest discoloration had been, disappeared.

It was interesting to note, by means of special observation of a certain limited area of one of the fundi, that the white opacities reappeared in the same configuration which they occupied before the bleaching process.

General medical examination revealed no pathologic findings. The blood Wassermann test was negative.

The patient has five children, three boys and two girls. All three boys were found to be red-green blind, but had no anomaly of adaptation. Two of them had a high compound hyperopic astigmatism, as in the case of their mother; one had normal uncorrected vision. The two girls had a disturbance neither of adaptation nor of the color sense. The fundi of all five children were normal.

The combination of congenital, stationary night blindness with the above-described fundus findings, and the phenomenon of Mizuo justified the diagnosis of Oguchi's disease.

Reading the restricted literature on this subject, one finds a mixture of established facts and interesting theories.

The known facts so far are: (1) The disturbance of adaptation has no causal connection with the phenomenon of Mizuo; in other words, the degree of night blindness is not altered appreciably

by disappearance of the fundus lesions (R. Takagi and R. Kawakami⁸). (2) The visual acuity, the visual fields, and the color sense are usually normal in Oguchi's disease. Any combination with disturbances of these functions is incidental, and available statistics show that the disturbances lie within the average for occurrences of such manifestations in any group of eyes without Oguchi's disease. In only one of the 27 Japanese cases was there a disturbance of the color sense similar to that of this patient; several patients had high refractive errors with slightly defective vision. (3) The disease is hereditary, the heredity being recessive and not sex linked (Kawakami⁹). (4) Histologic examination of one eye with Oguchi's disease (Oguchi¹⁰) revealed an extensive portion of the retina temporal to the optic nerve with an abundance of cones, a scarcity of rods, and misplaced cone nuclei outside of the external limiting membrane, a distribution of visual cells that in human beings is normally limited to the macular area, but in the eyes of certain animals is physiologic. Thus, while not giving any information concerning the nature of the substance that undergoes the photochemical reaction in the phenomenon of Mizuo (alterations of the pigment epithelium as described by Oguchi¹⁰ and Yamanaka¹¹ are too vague for useful interpretation), the histologic findings at least confirm the assumption that this type of congenital, stationary night blindness is not a disease in the narrower pathologic anatomic sense, but a congenital anomaly, possibly of an atavistic nature.

The theories concern mainly the location of the pathologic process: (1) The pathologic process underlying the night blindness is probably localized in the outer parts of the rods. If it were in the pigment epithelium, as has been sug-

gested by some, the function of the cones could not be normal in the majority of cases, as their function also depends upon the integrity of the pigment epithelium. (2) The visible changes in the fundus could be caused by transformation by light of a substance accidentally present in the retina, perhaps also in the outer parts of the rods. The nature of this substance is unknown. This revers-

ible photochemical process, however, reminds one of another reversible, photochemical process in the retina, which, according to Hecht's physical-chemical theory, is the very essence of the process of adaptation, the substance undergoing this change during adaptation being identical with the visual purple.

1758 West Harrison Street.

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THE PRACTICAL USE OF HOMATROPINE-BENZEDRINE CYCLOPLEGIA*

A FURTHER REPORT

LYLE S. POWELL, M.D.

Lawrence, Kansas

Stimulated by the work of Myerson and Thau¹ and recent reports of Beach and McAdams² regarding the use of benzedrine sulphate (amphetamine sulfate) as an adjuvant in cycloplegia, a number of studies have been undertaken using some four adrenergic drugs—namely, adrenalin, benzedrine, ephedrine, and paredrine—in conjunction with homatropine for the production of practical cycloplegia in the refraction of young adults. The homatropine-benzedrine combination has seemed most satisfactory.^{3, 4, 5} It is felt that cycloplegia is necessary in the routine ophthalmological examination and refraction of the average young adult; necessary, of course, both that the refraction may be more accurately estimated and also that the interior of the eye may be more completely and more satisfactorily examined. While the orthodox homatropine cycloplegia has proved quite satisfactory from the standpoint of the eye physician, still from the standpoint of the patient some objections—discomfort, annoyance, and loss of time—are rightly offered. Certainly a cycloplegia as complete as the usual homatropine procedure but of much shorter duration and accompanied by correspondingly less discomfort and annoyance is desirable. In the case of students, business men, stenographers, and others of like vocations, the inability to do close work for a period of 18 to 24 hours may be a problem of major importance.

*From the Department of Ophthalmology, Osawatomic State Hospital. Presented before the American Academy of Ophthalmology and Otolaryngology, at Washington, D.C., in October, 1938.

MATERIAL AND METHOD

At the Osawatomic State Hospital physically sound, coöperative patients, both male and female, of all age groups, are readily available for study. Following the studies among these groups, collateral use of these cycloplegic procedures has been carried out in the author's private practice. In determining the state of cycloplegia the patients were refracted first by retinoscopy with fixation in the distance. This was compared with retinoscopic findings with fixation at 30 inches. Marked discrepancy in these findings indicate lack of complete cycloplegia. Next, the trial-case refraction for distance was determined, and with this before the patient accommodation was checked with the Prince rule. And finally, following the suggestion of Dr. Rutherford,⁶ the degree of cycloplegia was estimated by placing a plus 3.00 D. sphere before the distance correction and checking the far point at 33 centimeters.

The usual homatropine-cycloplegia procedure was first studied and calibrated. For this group 24 patients within the 16-to-31-year range were studied. The following observations were first made:

1. The size of the pupils in millimeters.
2. The reaction of the pupils to light and accommodation.
3. Distance vision as determined by the Snellen chart.
4. The ability to read Jaeger test type.
5. Accommodation as measured by the Prince rule.

Patients exhibiting any pathological variations from the normal were excluded. Homatropine hydrobromide aque-

ous 2-percent solution was instilled in each conjunctival sac at the outer canthus every five minutes until four instillations had been given. Observation of the above-named details were made at the half-hour, 1-hour, 2-hour, 4-hour, 8-hour, and 18-hour intervals. Complete practical cycloplegia occurred in the majority of cases one hour after instillation. A beginning recovery of accommodation was observed in about half the cases eight hours after instillation. Complete recovery of accommodation as judged by the ability to read Jaeger 1 type did not occur in the vast majority of instances until or after the 18-hour interval. The pupillary size increased an average of 4 mm., reaching its maximum one-half hour after the last instillation. Beginning diminution in the size of the pupil did not occur until the 8-hour interval and had not regained the normal size at the end of 18 hours.

In studying the benzedrine-homatropine-cycloplegia reaction, similar groups of both male and female patients were selected, ranging from 16 to 31 years of age. One hundred cases were studied. Various modifications of technique were used experimentally. Two instillations of homatropine of 2-percent solution were found to be more uniformly effective than one drop of a 5-percent solution. Likewise, two instillations of one drop each of the 1-percent benzedrine-sulfate ophthalmic solution produced a larger pupil and greater clearness of the cornea than a single administration.

The following technique was finally adopted as most suitable. Two drops of homatropine aqueous 2-percent solution were instilled in each conjunctival sac at the outer canthus 5 minutes apart, two instillations thus being given of 1 drop each. This was followed in 5 minutes by two similar instillations 5 minutes apart of 1-percent benzedrine-sulfate ophthalmic solution. Beginning recession of ac-

commodation was evident in one-half hour, and at the end of 60 minutes complete practical cycloplegia existed in 93 percent of the cases. A beginning return of accommodation was evidenced by the ability to read Jaeger type at the end of 4 hours in about 50 percent of the patients. At the end of 8 hours 75 percent of the patients were able to read Jaeger 1 type and at the end of 18 hours there was a complete return of normal accommodation in all of the patients as measured by the Prince rule and the ability to read Jaeger 1 type. One-half hour after the first instillation the pupil in all cases had reached its maximum dilatation. The average dilatation was 4.5 mm. A beginning return of the pupil to normal was evident in most cases at the end of 4 hours and was complete at the end of 18 hours, in all cases. It was noted that recovery of accommodation occurred before the normal pupillary size was finally attained.

The adrenergic action of the benzedrine seems to have a definite clarifying action on the cornea as well as increasing the dilatation of the pupil. Both these factors are definite aids in the use of the ophthalmoscope and retinoscope. While the homatropine-benzedrine method has been found eminently successful in young adults, it is believed that in children, whose amplitude of accommodation is so much greater, the "homatropine alone" or "atropine alone" procedure is to be preferred. As a general rule, children under school age are examined by the "atropine alone" method while in those of school age the "homatropine alone" method is used.

The action of miotics in bringing about a return of accommodation following benzedrine-homatropine cycloplegia has been studied in 24 cases and eserine solutions have been found the most effective.⁴ Eserine-salicylate solution, buffered to a pH of 6.2, making it isotonic with the

tears, has been used to advantage. To a similar group was administered benzedrine-homatropine cycloplegia under the conditions described above. One-and-one-half hours following the administration of the homatropine, 1 drop of 0.5-percent eserine-salicylate buffered solution was instilled in each conjunctival sac. Eserine-salicylate, 0.5-percent buffered solution, overcame this cycloplegia and brought about a practical return of accommodation one-half hour after its administration. This was followed by a moderate but definite diminution in accommodation. However, as the decline in the effect of eserine progressed, it was met by the natural recovery from the effect of the drugs, so that the cycloplegia was overcome in all cases 5¼ hours following the administration of the first drop of homatropine. The use of 1-percent buffered eserine-salicylate solution also brought about a complete return of accommodation one-half hour after its administration, but this stronger solution exhibited a more lasting effect so that at the end of 4½ hours all patients were able to read J 1 type. No serious or untoward effects have been noted from the use of 0.5-percent buffered eserine solution, but in private practice a repeated dose of the 1-percent buffered eserine-salicylate solution caused one patient to have a violent attack of nausea and vomiting.

The following is the record of a graduate student in the Department of Physiology at the University of Kansas just recently examined. This man was arbitrarily chosen before examination as a case for presentation because of his understanding of the problem and his accurate observations. He proved to be an excellent case for demonstration. Several interesting points are noted:

- (1) Loss of accommodation in 60 minutes.
- (2) Extreme dilatation of the pupil.
- (3) Beginning recovery of accommodation in four hours.
- (4) Progressive but still incomplete recovery of accommodation at the eighth hour. (As a general rule, younger persons exhibit a more rapid and complete recovery, due to their greater amplitude of accommodative power.)
- (5) The rapid return of accommodation following the administration of 1-percent buffered eserine-salicylate solution.
- (6) The return of accommodation in advance of pupillary recovery.
- (7) The "come and go" effect of the eserine on accommodation and pupillary size, in the struggle for supremacy of effect.

At the eighth hour eserine salicylate, 1-percent buffered solution, was administered and six minutes later this student could read J 1 type with the right eye, J 2 with the left eye. Fifteen minutes later, or 21 minutes after the eserine was adminis-

MR. J. P., AGED 31 YEARS

Refraction: O.D.—0.75 D. sph. ≈—0.50 D. cyl. ax. 165°
O.S.—0.75 D. sph. ≈—0.50 D. cyl. ax. 15°

		0 hr.	½ hr.	1 hr.	2 hr.	4 hr.	8 hr.**	8.06	8.21	8.41	10 hr.
Near point	O.D.	J 1	J 2	J 0	J 0	J 7	J 6	J 1	J 3	J 1	J 1
	O.S.	J 1	J 3	J 0	J 0	J 0	J 6	J 2	J 3	J 1	J 1
Far point	O.D.	10 D	2.25 D	0	0	2.50 D	3.50 D	4.75 D	10 D	10 D	10 D
	O.S.	9 D	2.50 D	0	0	2.00 D	3.50 D	4.25 D	10 D	10 D	10 D
Pupillary diameter	O.D.	*3.5	8	9	9	9	8	8	1½	3.5	3.5
	O.S.	*3.5	8	9	9	9	8	8	1½	3.5	

* Millimeters.
** Eserine 1 percent administered.

tered, the accommodation had advanced to the normal amount in each eye, although he was able to read only J 3. This seeming contradiction was probably due to the extreme contraction of the pupils and the confusion resulting from the conflict between the cycloplegia on the one hand, and the natural tendency to recovery tremendously stimulated by the eserine solution, on the other. Twenty minutes later the eyes had reached their normal state both as to accommodation and pupillary size, as well as the ability to read J 1 type. There were no subsequent variations.

SUMMARY

Homatropine and benzedrine in combination used according to the suggested procedure gave complete practical cycloplegia in a high percentage of patients at the end of one hour. The homatropine-only groups showed a more rapid onset and a longer duration of cycloplegia with a subsequent delay in the return of accommodation. In the homatropine-benzedrine group there was a beginning return of accommodation at the end of four hours as contrasted with the homatropine-alone group, which shows a beginning re-

turn of accommodation in some cases only at the end of eight hours. There was a tendency to greater dilatation of the pupil in the homatropine-benzedrine groups, and the cornea was definitely clearer in these groups than in the homatropine-only groups. One-half-of-1-percent buffered eserine-salicylate solution overcame the cycloplegia and brought about complete return of accommodation one-half hour after its administration. This action showed a definite tendency to wear off and was not so permanent or lasting as that observed following the administration of the 1-percent eserine-salicylate buffered solution.

CONCLUSIONS

Homatropine and benzedrine used in combination will produce in 60 minutes complete practical cycloplegia in a high percentage of patients between the ages of 16 and 31 years. Beginning recovery is evident in four hours. Eserine-salicylate solution, 1 percent and 0.5 percent buffered to be isotonic with tears, will overcome homatropine-benzedrine cycloplegia promptly and restore the power of accommodation within one-half hour.

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DISCUSSION

DR. C. W. RUTHERFORD, Indianapolis, Indiana: Studies have been made during the past year on the effects of benzedrine (amphetamine) and paredrine when added to homatropine for cycloplegia, and on the significance of variations in the location of the far point (Transac-

tions of the American Academy of Ophthalmology and Otolaryngology, 1937, pp. 188-189). Both eyes of 174 private patients, including a few young myopic persons, were examined.

The patients were studied in six groups (table 1). All eyes received pontocaine to

control blepharospasm, and then homatropine in amounts appropriate to the age of the individual patient. Aqueous benzedrine sulfate, one drop of a 1-percent solution, was added to one eye of each patient in group II and to both eyes of the patients of groups III and VI. Pare-

IV indicated that homatropine and paredrine were more strongly cycloplegic than homatropine alone, as in groups I and II; but group V, in which the effects of the two methods could be compared in the two eyes of each patient, indicated that neither was materially stronger than the other.

TABLE 1

	Men	Ages	Women	Ages
Group I	13	20 to 53	12	18 to 53
Group II	25	17 to 48	15	19 to 51
Group III	13	18 to 55	19	11 to 53
Group IV	14	13 to 57	18	17 to 60
Group V	10	20 to 59	15	18 to 58
Group VI	7	11 to 50	13	21 to 60
Totals	82	11 to 59	92	11 to 60

drine hydrobromide, one drop of a 1-percent solution, was added to both eyes in group IV and to one eye in group V. Group I, included for comparison, was tabulated from records made before the study was begun. Groups II to VI were consecutive.

No factors such as age, sex, occupation, character of ametropia, presbyopia, and so forth, were of value for predicting the probable location of the far point.

Percentages of far points are given in centimeters and diopters in table 2. Assuming that the test is a practical one and that a variation of 0.25 diopters from 33.3 cm. (between 30.7 and 36.4 cm.) is acceptably good refraction, then group

Eyes in groups I and II that had homatropine alone showed 12¼ percent of far points outside the accepted variable of 0.25 diopter, and eyes in groups II and III that had homatropine and benzedrine showed 11½ percent outside. But of the eyes in group V, that had homatropine alone, all showed far points within the 0.25-D. variable, so it seemed unwise to discount the value of benzedrine without testing it again and with the more careful technique used in group V. Accordingly, group VI was studied.

Groups IV, V, and VI showed all far points within the 0.25-D. variable, a conspicuous improvement over what was found in preceding groups. This was due to an awakened conviction that human variables were responsible for diopter variations, and that greater care would be necessary in conducting future tests.

Close attention to the behavior of patients was rewarded with interesting and instructive revelations: (1) The test should be made leisurely. It is advantageous to watch the patient's lips; as soon

TABLE 2

Pr. in cm.		28.6	29.6	30.7	32.0	33.3	34.6	36.4
Pr. in D		.50	.37	.25	.12	.00	.12	.25
Group	Eyes	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
Group I	HA 50	8	10	8	14	38	12	10
Group II	HA 40	0	5	20	12½	32½	22½	7½
	HB 40	10	5	7½	17½	32½	25	2½
Group III	HB 64	3	6½	23½	17	23½	25	1½
Group IV	HP 64			7¾	18¾	25	39	9½
Group V	HP 25			12	8	12	64	4
	HA 25			4	16	4	64	12
Group VI	HB 40			5	25	32½	32½	5

HA—Homatropine alone.
HB— Benzedrine added.
HP—Paredrine added.

as they move, as though to speak, the test card is halted and then advanced very slowly until the designated word is read. (2) A daring patient attempts to read the word before it is clearly visible while a cautious one waits until sure of it. (3) Some persons can read words of square letters, like L E T, farther away than words of round letters, like C O D, while others can recognize round letters at the greater distance. Frequently a warning of this peculiarity will be detected while testing central acuity at six meters with letters of both forms in the same line, such as L C E O T D. (4) The test should be repeated until the operator is satisfied.

Conclusions: 1. The far-point test is a practical one. A variation of 0.25 D. from 33.3 cm. (between 30.7 and 36.4 cm.) is an expression of variability in human behavior of aptitude and it cannot be eliminated; there can be no uniform precise location of the far point. 2. Benzedrine and paredrine did not augment the degree of cycloplegia obtained with homatropine alone; both increased mydriasis, which was of no apparent advantage; both shortened the duration of accommodative disability, which was a welcome convenience to patients.

The solutions of benzedrine and paredrine were obligingly supplied by Smith, Kline and French Laboratories, Philadelphia.

DR. S. JUDD BEACH, Portland, Maine: It is very gratifying if the work that Dr. McAdams and I did in benzedrine and cycloplegics has been any factor in this very competent presentation by Dr. Powell. Continuing the work that was reported by us at the American Ophthalmological Society and the Academy last year, we are rather impressed with the notion that single instillations of our ordinary cycloplegics are much more effective than we have in the past been accustomed to

believe; and this is more or less consistent with the earlier use of cycloplegics, which, if you look back through the very beginnings of the literature, was to make single instillations of atropine. Now these single instillations of cycloplegics are so effective that it requires only a slight boost to make them sufficient for examinations of refraction, and this slight boost can be given in a number of different ways.

Our experience with these drugs rather leads us to believe that it makes no great difference whether you use the conventional method of repeating the instillation with the idea of getting cumulative action, or whether you use single instillations as Dr. Powell has described, reinforcing them with the adrenergic drugs. We are also rather inclined to think that it makes relatively little difference whether you use the 1-percent benzedrine or 1-percent paredrine or, as has been more recently recommended, paredrine in a 3-percent solution. Also it seems to produce a very similar result if you combine the solutions. It is perfectly possible, as we mentioned in our early reports, to use the cycloplegic and the adrenergic drug in the same solution in the manner in which cocaine and homatropine have been customarily combined.

The results of these investigations rather indicate that it is largely a matter of preferential use and the way in which they are used. At first we were firmly convinced that one drug was distinctly better than another, but after we compared the results in the same eyes at different times, using different drugs, we found that the variation which at one time indicated that one drug was better, might the next time show that the other drug was quite superior, and paradoxically enough, sometimes we found in the same patient that a 1-percent solution of paredrine, for instance, was apparently

more effective in the same combination with a cycloplegic than a 3-percent solution, and this has been more or less confirmed, I think by Tassman's experience with paredrine, which he recently published.

We have been inclined rather to make use of observations on a few intelligent and coöperative patients than to attempt to get mass figures.

I like very much Dr. Powell's phrase "complete practical cycloplegia," because the cycloplegia that we ordinarily get and that is quite satisfactory for purposes of refraction is, as he said, very remote from complete cycloplegia.

As we have previously stated, we still are convinced that the effectiveness of the combination depends largely on proper instillation of the cycloplegic. We have found it necessary to be particularly careful about the use of the adrenergic drugs, which seem to be quite effective. I think those who are using the strong solutions of adrenalin would probably agree with this. But a cycloplegic can very easily be flicked off or squeezed out of an eye and rendered almost inert. We still like our original routine, which has been to instill two drops of the cycloplegic and one drop of benzedrine or paredrine, whatever is preferred, and we still prefer 5-percent homatropine to the 2-percent. There are a number of theoretical reasons why this should be more effective, and we are rather inclined to the idea that it is.

The point where our experience diverges from that just reported by Dr. Powell is in the use of homatropine alone and atropine alone for children. I have no reliance whatever on homatropine alone used in the conventional way for children of school age, and in fact for any patients under 16 years of age; and, conversely, I feel that one of the greatest benefits and comforts to patients that I have had has been in the combining of

the adrenergic drugs with atropine for patients under 16 years of age. It is quite a comfort to be able to make one instillation of these combinations in the office and have them work inside of an hour, and in school children to be reasonably sure if this is done on Friday afternoon that they are going to be able to go back to school on Monday without any difficulty.

Our results still confirm us in the findings of our original experiments; namely, that we get within about a quarter of a diopter of as good relaxation as we have obtained in the past by the three-day performance of the instillation of atropine alone, and of course with much greater comfort to the patient and to the family, who do not have to make any instillations at home.

One thing about which I think it would be well to caution those who have never used this combination, is that benzedrine, and paredrine perhaps to a less degree, seem to dilate the tear duct very widely and very rapidly, so that in very rare instances—but often enough so that you should be on the watch for it—you get quite marked and prompt flushing of the face following the atropine instillation. This does not, however, follow if you use the adrenergic drug after having made both instillations of the cycloplegic. This may explain, possibly, the instance that Dr. Powell reported, in which he got nausea and vomiting following the use of eserine. Of course, if eserine is used after the tear passages are widely dilated, and the instillation is repeated a few times, a considerable amount is absorbed.

We can confirm the author's experience with regard to the use of eserine. Its application after the ordinary conventional use of homatropine is followed by very prompt apparent recovery from the cycloplegic, but the effect of the eserine soon wears off and the homatropine ac-

tion returns. In cases, however, in which the action of the eserine is maintained approximately as long as the action of the cycloplegic, quick recovery is maintained.

DR. WILLIAM CRISP, Denver, Colorado: Nowadays I practically never have any trouble from rapid absorption of the cycloplegic drugs. The reason is that I almost invariably insist that the patient shall have a meal a short time before I make the instillation. I called attention to that some years ago. If the patient has something in his stomach, you will hardly ever get disturbance from the use of atropine and homatropine, and you are much less likely to have disturbance from the use of hyoscine in moderately sensitive patients.

The combination that I personally have been using since I learned of the experiences of Doctors Beach and McAdams has been as follows: First of all, a 2-percent solution of cocaine; four minutes later a 1-percent solution of benzedrine or more recently (because the manufacturer seems to think that paredrine is a little better than benzedrine and is sending out the sample preferably of paredrine) 1 percent of paredrine; then four minutes later one drop of 5-percent homatropine. I am disposed to think that my experience has borne out Dr. Beach's statement that you get better results from one drop of the stronger solution of homatropine than from the two drops of the weaker solution. I used to use two drops, 2½ percent.

This combination, which I have found very satisfactory, after one hour, meets the objection that has been raised to the use of the paredrine before the homatropine; namely, that you shrink the passage and tend to carry off your drug too rapidly. With the proper method of instillation I do not believe this objection has any particular validity.

We also put the drugs in above the

cornea so that the film of solution at once spreads over the whole cornea. I believe that the presence of the film over the cornea is the most essential part of the procedure. I think any excess of the drug which you may put in will not have much chance of absorption anyhow, because it either flows down onto the cheek or goes into the lower culdesac and is rapidly taken care of by the nasal ducts.

I do believe that I gain materially as to the other two drugs by the preliminary instillation of the 2-percent solution of cocaine, because not only do I anesthetize the patient's eye as to sensitiveness to the next instillation, but I have the well-known further synergistic action of cocaine with the other drugs. My experience has quite borne out this line of argument. In fact, in some cases, even in young people, it seemed to me I had perhaps as perfect cycloplegia as was ever obtained, as indicated in both the near-point and far-point test. The use of the term "far-point test" seems rather confusing to me, and I prefer to say as indicated by the extremely prompt reaction of the patient to very slight changes in the sphere, even sometimes objecting to a slight reduction in the total amount of plus sphere which I have worked out because it was said that the vision was not so good.

As to the use of eserine, I usually use one in 240, or as it is made up, one grain of eserine sulphate or salicylate to a half ounce of distilled water, and I have repeatedly observed that the patient's condition the same evening is better than that the next morning. Dr. Beach rather jocularly said the patient has hardly got out of your office before the effect of the eserine has worn off. Usually that evening the patient gets along pretty well but the next morning he is pretty apt to relate to you that he doesn't get along as well as he did the night before. That is because

the effect of the eserine is diminishing very rapidly and the effect of the homatropine is still there to some extent

I think this technique is quite an addition to the convenience of carrying on our work, both as regards the patient and as regards the work that has to be done by the office assistants.

DR. I. S. TASSMAN, Philadelphia, Pennsylvania: I began the use of benzedrine sulphate in aqueous solution in addition to homatropine hydrobromide following the work of Dr. Beach, and in the same manner I completed quite a number of cases. The results that I obtained correspond very closely with the results that were reported by Dr. Beach.

I began in using benzedrine sulphate to use the same strength solution that Dr. Beach reported, a 5-percent solution, and then experimented in various ways, using weaker strength, including two drops of the 2-percent solution in the way that was described by the essayist this afternoon.

About a year and a half ago the effect of paredrine came to my notice, after research by two investigators at the University of Pennsylvania. I then substituted paredrine-hydrobromide aqueous solution for the benzedrine-sulphate solution, also trying various strengths, beginning with two drops of the 2-percent solution, one drop of the 4-percent solution, and again one drop of a 5-percent solution. In the case of neither benzedrine nor paredrine, were the results obtained so satisfactory with the two drops of a 2-percent solution as those obtained with the one drop of a 4-percent or a 5-percent solution. It did seem that the results with the one drop of a 4-percent solution were practically the same as those obtained with one drop of a 5-percent solution.

I feel, as Dr. Beach does, that the important thing is the accuracy in the instillation. Where only one drop of a drug is being instilled into the eye, it must be

made absolutely certain that the instillation is done properly so that the effect can be obtained. Certainly there is no objection to instilling the second drop, either of the cycloplegic or the paredrine, and almost routinely I have been using a second drop always of the paredrine solution.

Again I think that we ought to emphasize the need that was mentioned by Dr. Rutherford in accuracy in the subject of tests; that is, being absolutely certain the patient is coöperating and giving the examiner the proper answer, and is not in too much of a hurry to make a reply. I think that repeated questioning in this respect is absolutely essential in order to determine the accuracy of either the far point or the near point.

Again with regard to dilatation of the punctum, I found that this was not a complication with the use of paredrine, and that with the use of paredrine it makes no difference what drug is instilled before or after the use of homatropine or atropine.

As to children of school age, or below the age of 15 or 16 years, I found that it is satisfactory to use the one drop of 1-percent solution of atropine sulphate, followed in three or four minutes by a drop or two of 1-percent aqueous solution of the paredrine hydrobromide. The results obtained are practically the same as those that are obtained after the repeated instillation of atropine sulphate. As a matter of fact, I believe that we really make the numerous or repeated instillations in the ordinary way first of all because they are made at home, they are instilled by a parent who is not too adept in making an instillation even though careful directions have been given, and it is done principally to insure that at least a couple of drops are properly instilled.

Lastly, it is certain that if we have a

method that gives us in office practice a procedure that procures the same results with a rapid recovery, such as has been shown to take place in these cases, we have something that is an advance in our method of producing cycloplegia in refraction.

DR. LYLE S. POWELL, in closing: Mr. Chairman, I wish to thank the discussers. They have been very kind. I have only a few things I wish to say. The matter of paredrine has been injected into the discussion and I wish only to mention in passing that we have conducted parallel studies with paredrine. In calibrating these drugs with patients, however, we found that there was a slight but definite decrease in accommodation when used for mydriasis only.

We felt that inasmuch as benzedrine

and homatropine in combination were entirely competent in the production of practical cycloplegia, we would not report on paredrine at this time. We do think, however, that it is a valuable drug, but it is not in our opinion so valuable for use in mydriasis only, because we found a slight reduction in accommodation that we did not find with benzedrine.

I agree with a great many of the things that have been said about atropine, and I am forced to agree with the ones who use one drop. I think that is part of the art of the practice of medicine—one develops his own technique, and to me that is one of the nonessentials. The fact remains that to us, at least, this benzedrine and homatropine combination has resulted in a good, practical method of cycloplegia.

OCULAR PAPILLOMA

R. E. WINDHAM, M.D.

San Angelo, Texas

Papillomata of the eye seem rare enough and present so many interesting and perplexing features, that all cases with their most successful methods of treatment should be reported. One has but to search the literature and review the standard textbooks to appreciate the scarcity of published information, the limited number of reported cases, and the absence of a standard or accepted treatment.

The vast majority of papillomata reported have been on the caruncle and palpebral conjunctiva, but my report is limited to those appearing on the ocular conjunctiva and cornea.

The etiology is an unsettled question. Some ascribe these growths to trauma, as, for instance, an injury to the eye, or the result of foreign bodies such as sand and cement, or lime burns, and the removal of pterygia.

I am convinced that adult papillomata are due to trauma from wind containing much dust and grit, for all cases seen were in a section where dust-laden wind is prevalent and occurred among people who spent most of their time out of doors exposed to the wind. Furthermore all cases were on developed or potential pterygia, which are caused entirely by exposure.

For papilloma in the juvenile we must find some other cause. The absence of any history of trauma or irritation suggests that there may be a congenital predisposition, and the rapid recurrence of papilloma following repeated removals might suggest that these growths are locally infectious. The apparent contagiousness of

laryngeal papilloma and its infectious nature in animals might suggest a possible relationship to ocular papillomata.

Papillomata usually occur in one or other of two forms, diffuse papillomatosis, the villous mass with or without a pedicle, and the mushroom, cauliflower, or raspberry type. If the epithelial elements predominate, the papillae are closely packed and the growth is smooth. If the vascularized connective tissue is in evidence the tumor has more branching processes and represents the typical appearance of a papilloma.

The pedunculated type has to be distinguished from granuloma, tubercle, vernal conjunctivitis, and condyloma, while the sessile type must be distinguished from carcinoma, lymphangioma, vernal conjunctivitis, xerosis, epithelial plaques, and pterygium.

The limbus seems to be a common site for papillomata, because, as Fuchs says, it is the only part of the ocular conjunctiva that normally contains small papillae.

My experience does not confirm the usual textbook statement that locations of election are the plicae and caruncle, even though the caruncle is a veritable pathological emporium; neither does my experience indicate that malignant degeneration is very common. In spite of the many common ailments and tumorous growths of the conjunctiva, true papillomata are relatively rare.

This report includes only cases of ocular papillomata clinically diagnosed and confirmed by pathological examination. It includes eight cases that were cured and one that resulted in enucleation.

Dr. E. H. Cary¹ of Dallas, Texas, reported the case of a man aged 82 years. The condition was of one year's duration

* Presented before the American Academy of Ophthalmology and Otolaryngology, at Washington, D.C., in October, 1938.

and so extensive that a diagnosis of epithelioma was made and the eye enucleated. The pathological examination proved it to be only a simple papilloma.

Dr. Martha B. Lyon,² of South Bend, Indiana, reported the case of a child 5½ years of age. This tumor was of two years' duration and supposedly followed an injury. There were four recurrences.

Dr. Robert J. Masters in discussing this case reported the case of a girl, aged 20 years, treated and cured by repeated applications of the thermophore.

Freytag³ reviewed the literature, reporting 34 cases, 11 of which occurred at the limbus and 6 on the ocular conjunctiva.

Dr. William B. Dougherty⁴ of New York reviewed the literature and reported two cases. He stated, "In reviewing the literature, I was surprised indeed to learn of the number of cases of papilloma of the cornea and corneoscleral margin that presented both clinically and microscopically all the characteristics of these new growths and later developed malignant degeneration." In this respect I am more surprised than he, as none of my cases showed any malignant degeneration.

Dr. Julius Fejer,⁵ of Budapest, Hungary, reported a case of papilloma with diagnosis of an associated carcinoma due to a markedly atypical proliferation of the epithelium.

He states, "To establish a differential diagnosis between papilloma and carcinoma is often rather difficult, although the first never penetrates into the depth of the corneal tissue, has a cauliflower or raspberry appearance, and undergoes fungoid growth across the limbus without blending with the latter."

R. Beatson Hird⁶ of Birmingham, England, reported three cases: one, in 1913, involved the caruncle, and he was consulted because of a chronic discharge of the eye. The growth was removed surgically and its base cauterized.

In 1929, he was consulted, in the second case, by a boy of 14 years, because of a severe ocular hemorrhage. A large papilloma was removed from the inside of the lower lid. The third case was in a woman aged 39 years with papilloma in the lacrimal sac. She had had repeated operations during childhood.

Dr. W. C. Souter,⁷ of Aberdeen, Scotland, reported a case of diffuse papillomatosis in a plasterer, aged 49 years, terminating in a spontaneous cure. He reviewed the literature, analyzing 32 cases.

Dr. M. F. Weymann⁸ of Los Angeles, California, reported two cases, cured by the use of the Shahan thermophore.

The first pathological description of a papilloma was made by Gayet⁹ in 1879.

Practically all pathological reports define the growths as being chiefly of fibrous tissue with groups of squamous epithelial cells. Groups of large and small cells with some fibrous vascular tissue, and even those appearing at the limbus which receive their epithelial elements from the cornea, derive their vascular connective-tissue core from the conjunctiva.

CASE REPORTS

Case 1. Mrs. A., a ranch woman, aged 35 years, had noticed a growth on the nasal side of the left eye some eight months prior to consultation. It had grown rapidly since then, accompanied by some tingling and shooting pains, until it seemed to interfere with proper closure of the eye. The growth, 6 mm. by 10 mm., was removed and the base cauterized. It recurred in two weeks, when a cautery again was used and a cure secured.

Case 2. Mrs. M., aged 30 years, wife of a railroad man, had a growth, 10 mm. by 15 mm., on the nasal side of the right eye, of four months' duration. It was removed, cauterized, and cured in one treatment.

Case 3. Mr. S., aged 40 years, a railroad mechanic, presented a tumor of the con-

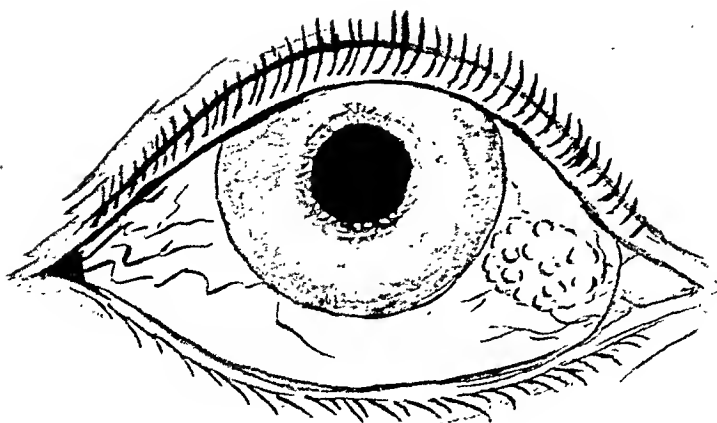


Fig. 1 (Windham). Case 2, right eye, nasal.

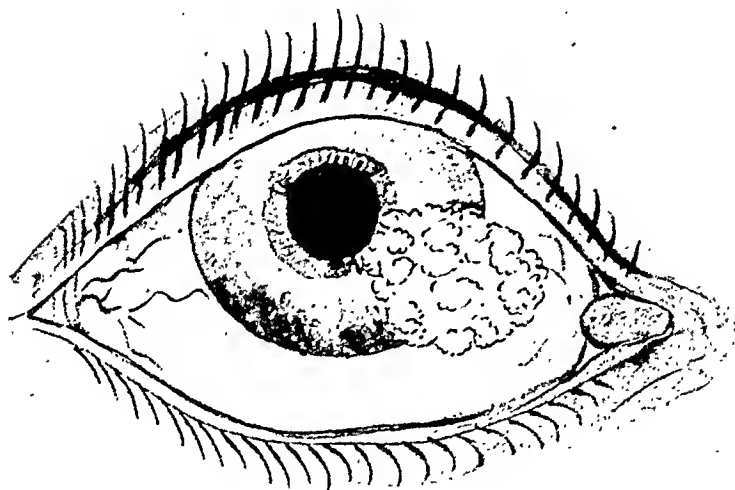


Fig. 2 (Windham). Case 4, right eye, nasal.

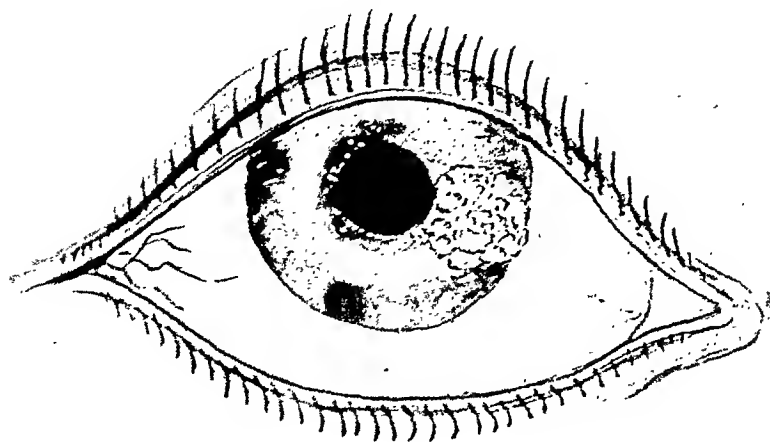


Fig. 3 (Windham), Case 5, right eye, nasal.

Fig. 4 (Windham). Case 6, right eye, temporal.

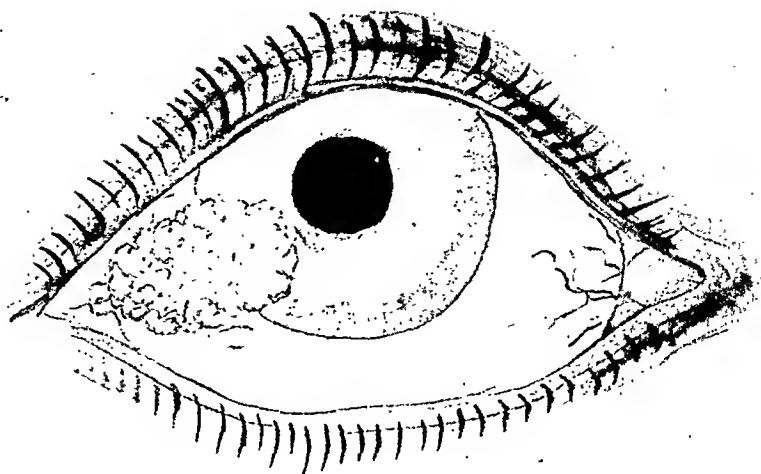
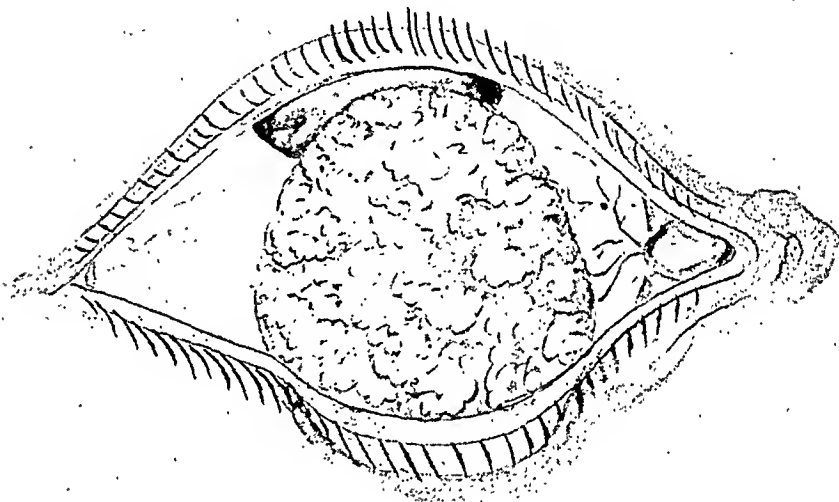


Fig. 5 (Windham). Case 6, right eye, below cornea.



junctiva on the temporal side of the left eye, 8 mm. by 12 mm., of three months' duration. It was cured by one application of the thermophore.

Case 4. Mr. P., aged 42 years, a ranchman, presented a tumor, 7 mm. by 9 mm., on the nasal side of the right eye at the limbus, the growth being of six months' duration. It was removed and the cautery applied. It recurred but was cured by application of the thermophore.

Case 5. Mr. W., aged 65 years, a ranchman, presented tumors of both eyes situated on the nasal sides of the corneas, which could be seen by the patient. The growths were of about seven months' du-

ration. The thermophore applied to each eye effected a cure with one treatment. The growths were about 5 mm. by 7 mm. in size.

Case 6. Mr. E., aged 65 years, a rancher-farmer, applied for treatment for a large conjunctivo-corneal growth on the temporal side of the right eye. He had been told by a doctor that it was cancer. The mass was extensive, fungoid or cauliflower in appearance, and of a distinctly grayish color, extending down to the sclera and through Bowman's membrane. With local and ciliary-ganglion block anesthesia, the mass was removed and the base cauterized. The growth reappeared

in the lower quadrant, was removed, and the base cauterized. Soon the tumor reappeared on the nasal side of the eye and was again removed with cauterization of the base. The patient was not seen for several months; then he returned with a very large mass in the lower quadrant, pushing the cornea completely beneath the upper lid. At this time an orbital evisceration was done, curing the papilloma but sacrificing the eye. In spite of repeated operations and office treatments, this case showed no evidence of malignant degeneration.

Case 7. Mr. P., aged 55 years, a traveling salesman, had a 5 mm. by 9 mm. growth on the nasal side of the right eye of one year's duration. A single application of the thermophore resulted in a cure.

Case 8. Mr. L., a farmer, aged 50 years, had a limbal growth, 6 mm. by 8 mm., of about nine months' duration, on the nasal side of the right eye. Thermophore application resulted in a cure in one treatment.

Case 9. Mr. M., a laborer. This case was picked up accidentally while making a routine examination in January, 1937. A small growth, pinhead in size, was detected in the conjunctiva on a well-developed pterygium on the nasal side of the left eye. This growth was diagnosed clinically as a papilloma and after explaining its significance to the patient, I agreed to remove it and the pterygium free of charge if he would let me observe its growth and study it. This he agreed to, and I considered it a unique and interesting privilege to watch a papilloma grow from infancy to large size. The growth was removed in May, 1938, approximately 17 months after its first detection and, at the time of its removal, had grown from 1 mm. to 8 mm. in diameter. It was removed by one application of the Shahan thermophore, following which the ptery-

gium was removed: to date there is no evidence of recurrence.

TREATMENT

Various types of treatments have been tried. Radiotherapy should not be used because it seems to stimulate activity. Also it affects normal vital tissue too severely and leaves the cornea with a denser vascularized cloudiness than before.

Careful resection of the papilloma and cautery of the denuded base will result in a fair number of cures. With the cautery one can control fairly accurately the degree of heat penetration, thus saving vital and uninvolved tissues.

Diathermy may be used but one cannot accurately control its extent or penetration in order to avoid unnecessary tissue destruction.

Even though Shahan (personal communication) does not especially recommend it for treatment of papilloma, the Shahan thermophore should be the method of choice, since papillomatous tissue in the eye melts away as if by magic at a temperature of 150° to 160°F., which is not sufficient to destroy normal tissue. With it one can melt away the growth, leaving normal, healthy, uncauterized tissue beneath and by careful, diligent application of one to two minutes, one may usually effect a cure with one treatment without scarring. Carcinomatous tissue will not melt away with this degree of heat.

SUMMARY

The etiological factor of papilloma is believed to be chronic irritation, as from dust-laden wind, for all ocular papillomata are in the palpebral opening on pterygium or potential pterygium, and those on the cornea are likewise in the palpebral fissure.

2. Any such growth showing intraocular extension—for example, into the anterior chamber—should be considered carcinomatous, as the progression of a papilloma is forward and not backward.

3. If papillomata are not due to irritation and exposure, no one has been able to explain why they occur only in the palpebral opening and not around the cornea.

4. Whether due to trauma or to an invisible filtrable virus, as has been suggested by Sir St. Clair Thomson, their tendency is to recur unless destroyed at the initial treatment.

5. Papillomata of the pedicled or loosely attached type are much more likely to be cured in the initial treatment, whereas the sessile type is less amenable to one treatment.

6. A case that shows no recurrence in the original area within one year should be considered cured; a recurrence after

one year in another area should be considered as having come from the same cause as the original papilloma. A malignant lesion appearing after one year should be considered as having no relation to the original papilloma. It is believed that these benign tumors do not become malignant; if malignancy is present, it has probably existed from the beginning and is not due to a change in the character of the papilloma.

7. A papilloma begins as a small tumor or nodule with a characteristic appearance, then bursts into a lobulated cauliflower mass, which grows rapidly for the first six or eight months. It then slows down into a rather sedentary cauliflower tumor of many lobulations with vascular-tissue proliferation.

8. Of the various types of treatment reported, the Shahan thermophore gives the best results.

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DISCUSSION

DR. R. J. MASTERS, Indianapolis, Indiana: Having accepted the assignment of opening the discussion of this paper, I was very promptly confronted by the realization that I was not at all sure that I knew what constitutes an ocular papilloma. Now, after careful study regarding this type of tumor, I cannot be sure that I have ever seen one, although I think that I have treated two of the sessile type. I have not encountered a papilloma of the lobulated, mulberry-shaped type, although it seems that this variety should offer less difficulty in its clinical diag-

nosis than the sessile type. Even in the microscopic section, a flat papilloma of the bulbar conjunctiva may be hard to distinguish from an epithelioma of low-grade malignancy. Clinically, several kinds of epibulbar tumors may look very much alike, and resemble a papilloma of the sessile type. To illustrate this point, I have chosen the following case histories for brief presentation.

Case 1. A white female, aged 16 months. A flat, smooth-surfaced, yellow-pink tumor of the bulbar conjunctiva of the left eye, extended from the semilunar

fold outward and upward and downward so that the entire nasal half of the conjunctival surface was affected. Two treatments with the Shahan thermophore were employed, under general anesthesia, two weeks apart. At the first treatment there were three one-minute overlapping applications of a large tip at 150°F., covering the upper half of the tumor. The second treatment was similarly applied to the lower half. The tumor disappeared and did not recur. Two other ophthalmologists agreed with my tentative diagnosis of unpigmented nevus in this case. Far too large for excision, the tumor was never examined under the microscope.

Case 2. A white male, aged 42 years, was examined one month after his left eyeball received a glancing blow by a pipe wrench. Two days after the injury, a blister appeared on the bulbar conjunctiva immediately adjacent to the temporal limbus. After seven days the blister had changed to a firm pinkish-gray, flat tumor of oval shape, measuring 6.5×5 mm. Dilated vessels entered it from above, below, and temporally. There was no infiltration of the cornea. The Shahan thermophore at 145°F. was applied for one minute. Two weeks later Dr. Shahan, visiting in Indianapolis, saw the tumor, which had reduced in size to 5×4 mm., and advised its excision. The pathologist reported that the sectioned tumor showed a small bit of squamous epithelium and granulation tissue overlying loosely organized connective tissue, with all of the underlying tissues presenting the features of a proliferative inflammatory process. This tumor was probably a granuloma, although its surface seemed to be fully and smoothly covered by epithelium. Small and firm as it was, it should have been excised in the first place. As the patient objected to excision the thermophore was used, which brought about some reduction in size of the tumor.

Case 3. A white male, aged 68 years. Six weeks following the subconjunctival injection of 10 minims of 1:6,000 cyanide-of-mercury solution in the upper temporal quadrant of the right globe, a small elevation was noted at the temporal limbus. This tumor measured 5×3 mm., was of a gray-pink color, and had a small white ulcerated patch upon its surface. It overlapped the limbus, but did not infiltrate the cornea. Engorged conjunctival vessels entered it. Three months passed before this tumor was again observed. It had overlapped the cornea still farther, without involvement of the corneal tissue, and there was no ulceration of its surface. The 7 mm. thermophore tip at 158°F. was applied twice for one minute, covering the tumor surface thoroughly. The tumor disappeared, leaving the eyeball of normal appearance 30 months later. Early ulceration of the surface of this tumor suggested epithelioma. Subsequent healing of this surface ulceration together with very slow growth and lack of corneal infiltration suggest the possibility of a more benign tumor which followed the injection of mercury solution under the conjunctiva.

Case 4. A white female, aged 19 years. Four months before coming for examination she had noticed a fleshy growth on the nasal aspect of the left globe. Later a second growth appeared on this eyeball, and two similar lesions on the right globe. Examination revealed two gray-pink sessile tumors in the right bulbar conjunctiva, extending upward and downward, respectively, from the semilunar fold. Upon the left eye were two similar growths in similar position, the upper one being pedunculated. The latter was excised, the other three treated successfully with the thermophore. There had been no recurrence 17 months later. Section of the excised growth led to a diagnosis by the pathologist of epithelioma of low-

grade malignancy. His detailed description, however, strongly suggested papilloma. There was a very vascular core, surrounded by a small amount of fibrous tissue containing many lymphocytes, with a covering of several layers of squamous epithelial cells which infiltrated the underlying structures at some points. This case was interesting and satisfactory, in that one growth was available for section while the others responded to thermophore therapy. The cause of the condition was subject to conjecture, but the patient had used mascara on her eyelashes in profuse amounts for many months.

I am glad that the essayist has again directed our attention to the use of the Shahan thermophore in the treatment of some epibulbar tumors. Soft flat growths that are not thicker than 1 mm. and that involve a large area of the bulbar conjunctiva, may be given a therapeutic test with the thermophore. Firm growths and those of moderate size should be excised. Papillomata that arise at the limbus, whether the type that grows outward from the surface, or the kind that invades the corneal substance, should preferably be excised. This applies probably to all of the pedunculated papillomata. There are, however, occasions when surgery is strongly resisted by the patient and another type of treatment is desired. The essayist has therefore performed a service to us by recounting his encouraging experiences with the thermophore in his large group of cases of papilloma of the bulbar conjunctiva. My less extensive experience supports his conclusions regarding the value of the instrument.

DR. WILEY R. BUFFINGTON, New Orleans, Louisiana: In the first place it must be conceded from statistical data that malignant or recurring ocular papilloma is relatively rare, in spite of the fact that Shumway, before the Section on

Ophthalmology, A.M.A., 1903, stated that it is a common type of conjunctival tumor. Elschnig as early as 1889 said that they are rare. A review of data from six German authorities during the period from 1884 to 1899 suggests that papilloma is rather common.

To determine the exact frequency, careful clinical diagnoses should be made; more important still, precise histological study. In a review of many case reports, I am inclined to think the latter has not always been thoroughly done. Granuloma arising over the site of ocular muscle operations has been classified by one textbook under the papilloma group; yet, these tumorlike formations are made up of inflammatory tissue. They do not recur after excision.

The case reports so well given by Dr. Windham show that recurring or malignant papilloma is far more frequent in southwest Texas than it is in Louisiana. In that section the climate is dry, the wind is heavily laden with dust and sand; in Louisiana, moisture free from dust fills the atmosphere. It would seem that conjunctival irritation from exposure of such substances is a most important etiological factor.

My statistical reports show that recurring papilloma is extremely rare in Louisiana. From 1922 to 1937, 14,686 eye patients were admitted to Charity Hospital for operations on the eye. Among these only 11 were authentic cases of ocular papilloma. In my private series only three cases are found among upward of 25,000 patients. These facts would suggest that climatic conditions may account for the relative infrequency of conjunctival papilloma.

True malignant recurring papilloma must be distinguished from other ocular conjunctival growths, hyperplasias, and conditions. Dr. Windham has named most of these. Papilloma has certain character-

istics that distinguish it from other ocular conjunctival tumors:

1. Papilloma is a small flat tumor.
2. It has an uneven or velvety surface due to the fact that it is covered by minute elevations. It is composed of branching papillae of connective tissue, surrounded by a thick layer of stratified epithelial cells. The thin-walled blood vessels often resemble endothelial tubes.
3. Conjunctival papilloma invariably recurs unless properly treated. In some cases it recurs again and again in spite of the most efficient treatment.
4. True papilloma never metastasizes.
5. It may undergo malignant or carcinomatous degeneration.

"The regular disposition of the cells, the intact basement membrane, and the delicate fibro-vascular case help to indicate the difference between papilloma and carcinoma" (Souter). The demarcation between malignancy and nonmalignancy is not always easy to determine. Breaks in the basement membrane, invasion of tumor cells, suggest malignancy. Coover's case (*Amer. Jour. Ophth.*, 1920, v. 3, p. 683) is worth referring to (see fig. 1).

This papilloma occurred in a scar at the temporal limbus in 1903. It was removed. The pathologic report was papilloma. In 1913 there was recurrence of a massive growth which was removed. Report was pathologic basal-cell epithelioma.

Gourfein (*Review gen. d'Ophth.*, 1927, v. 42, p. 5) reports a case of epibulbar papilloma arising from a limbal scar.

Diagnosis: Papilloma undergoing carcinomatous changes. Pascheff (*Royal London Ophth. Rep.*, 1905, v. 16) states:

1. Primary limbal papilloma is rare.
2. It may develop quickly.
3. It recurs frequently after operation. Recurrence may occur in a few days or be delayed more than two years.
4. It often undergoes malignant degeneration.

Terrein and Cousin (*Arch. d'Ophth.*,

1931, v. 48, p. 622) discuss the close relation between limbal papilloma and carcinoma. In their opinion, papilloma may be the transition state of malignancy.

Preponderance of evidence from many other authorities confirms the reports and opinions of those just quoted.

Treatment: From a clinical standpoint, prompt and effective treatment is important to prevent recurrence and to forestall malignant degeneration.

Complete removal is not sufficient in the successful treatment of the conjunctival papilloma involving the cornea. After removal the denuded area must be treated by some cauterizing agent. Recurrence may take place in the original site. Usually, however, if the tumors are astride the limbus the recurrence is an extension above or below. Frequent observation of the lesion is important. With the first sign of recurrence, prompt treatment must be instituted. This may be once, twice, or many times. Removal and cauterization are more effective in the treatment of papilloma than irradiation, or even combined removal and irradiation. The cauterizing agent may be the electric cautery, the thermophore, or a chemical such as glacial trichloroacetic acid. In my hands the latter has been the most efficient. It can be used with great frequency with minimum permanent damage to the cornea and sclera.

CASE REPORTS—OCULAR PAPILLOMA

Case 1. On June 14, 1932, Mr. F. T. L., who was 44 years of age, white, presented a recurring growth on the conjunctiva and limbus of the left eye. It had been removed four times since August, 1931, the last operation having been performed on May 1, 1932. Examination of the left eye revealed two flat vascularized tumors involving the conjunctiva and cornea (fig. 1). X-ray and radium treatments had been applied by Dr. V. from June to December, 1932. On December 15, 1932, the

tumors in spite of X-ray and radium treatment, had grown steadily and became confluent at the temporal limbus (fig. 2). On December 17, 1932, the tumors were removed under local anesthesia. They were found to be attached to both the sclera and the cornea. The denuded surfaces were treated with electric cautery, and the area covered with a sliding conjunctival flap. Two small recurrences at the upper limbus were removed and cauterized on May 18, 1933. On May 24, 1933, a 5-mm. round, flat tumor astride the upper limbus had returned.

It was removed and the surface was treated with electric cautery. On January 8, 1935, recurrence of the growth along the temporal limbus was noted. This time it involved half the temporal limbus (fig. 3). Recurrence was noted by the patient in one week. On January 22, 1935, I completely excised the papillomatous growth. The attachment of this recurrence was at the limbus. The tumor overlapped the cornea. The whole denuded surface was then touched with glacial trichloroacetic acid. The clinical diagnosis was recurring papilloma of the conjunctiva and cornea, and the pathologist's report was papilloma, suggestive of undergoing a squamous-cell carcinomatous degeneration. To date there is no recurrence. Vision of both eyes is 20/20, or normal (fig. 4).

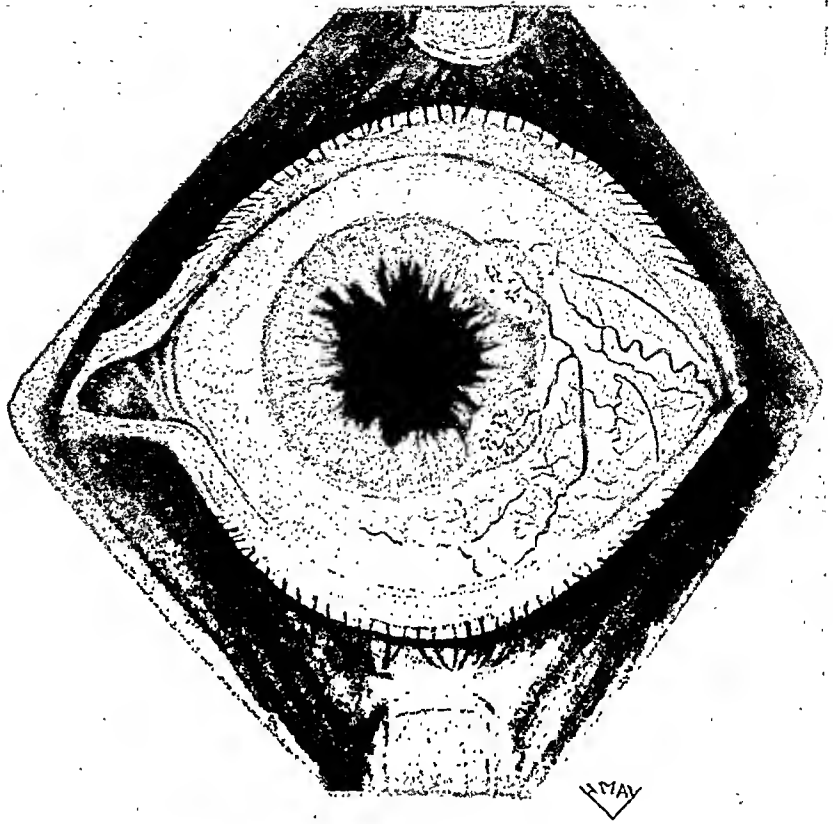


Fig. 1 (Buffington).

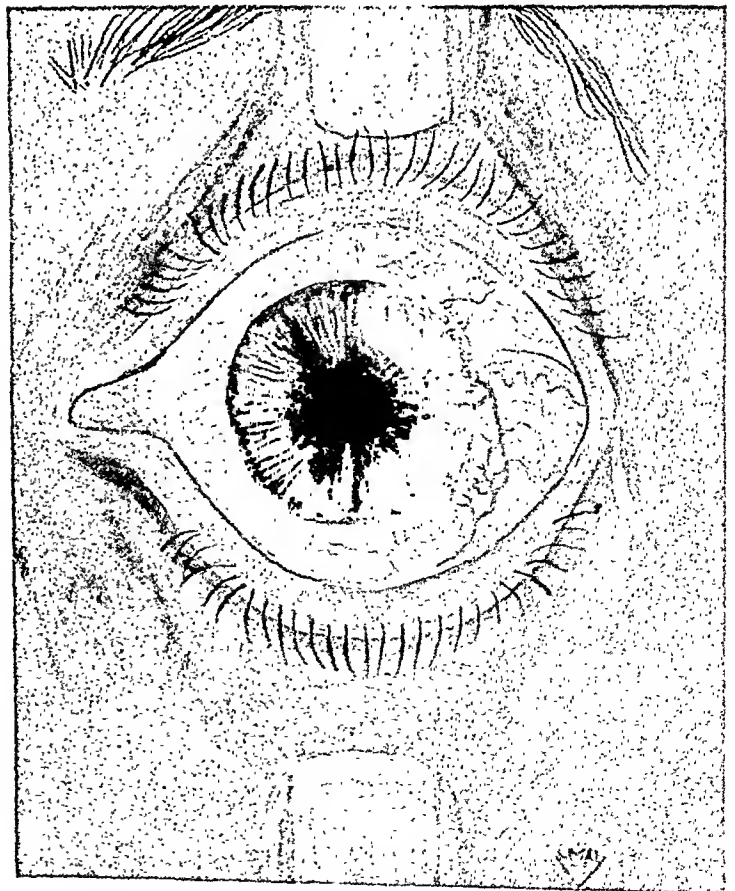


Fig. 2 (Buffington).

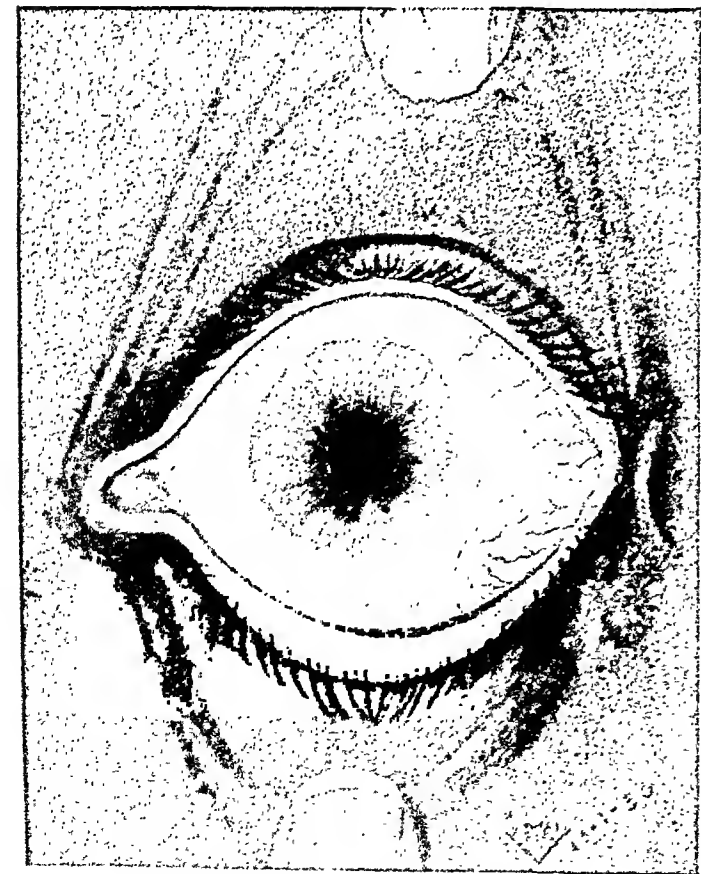
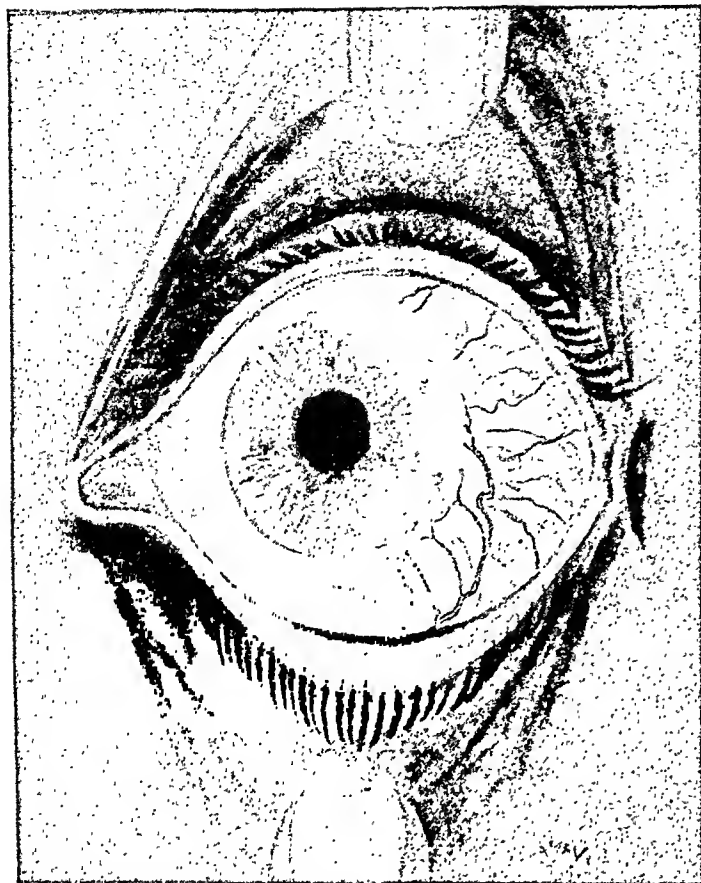


FIG. 3, top; FIG. 4, bottom (Buffington)

Case 2. On January 17, 1936, Mrs. G. A., who was 58 years of age, white, was seen with a growth on the right cornea, pin-head in size, first noticed about six months previous to this date. Prior to the appearance of the growth, the eye was red. The growth doubled in size in three months. The tumor was flat, vascularized, overlapping the cornea about 2 mm. There were prolongations along the limbus downward. The tumor was loosely attached to the conjunctiva and cornea (fig. 5). It was removed, and the base touched with glacial trichloroacetic acid. Clinical diagnosis was papilloma of the conjunctiva and cornea; pathologic diagnosis was papilloma, no malignancy. A recurrence of the papilloma was noticed on October 15, 1936, extending from the 5 to 9-o'clock position along the limbus. It was removed and the whole area touched with trichloroacetic acid. On May 5, 1937, a recurrent, flat, 4-mm. papilloma came at the lower limbus. A smaller recurrence was noted at the upper limbus. Both were treated by excision and trichloroacetic acid. There has been no recurrence to date. Vision, October 1, 1938: right eye, 20/40, left eye, 20/20.

Case 3. Mrs. A. C. C., aged 29 years, white, was seen on November 11, 1936, because of a growth on the right eye of four months' duration. A 5-mm., round, circumscribed tumor of the conjunctiva was situated nasal to the limbus. The surface was rough, and leading into the mass were several large blood

vessels. A diagnosis was made of papilloma of the conjunctiva. The tumor was removed, and the denuded area touched with glacial trichloroacetic acid, and then covered with conjunctiva. The pathological report was squamous-cell carcinoma. There has been no recurrence.

DR. EDWARD STIEREN, Pittsburgh, Pennsylvania, illustrated with lantern slides a huge cauliflower growth of the right bulbus in a male, aged 45 years. Arising over the external rectus by a strong pedicle, it took on a mushroom shape, and was 12 mm. in length, 8 mm. in width, and about 10 mm. high. It reached to the external canthus, overlapped the cornea to its center, and projected forward between the lids, which could not be closed over it. The surrounding conjunctiva was inflamed and thickened and there was considerable ropy discharge. The color and general appearance of the mass was that of a pale red raspberry. There was no involvement of the preauricular or any of the lymphatic glands. According to the patient's statement the lesion was first noticed about a year previously as a localized inflammation with a slight elevation.

The growth was excised and the defect covered with a sliding conjunctival flap. At only one point, over the insertion of the external rectus, was it adherent to the globe. Healing was prompt and unevent-

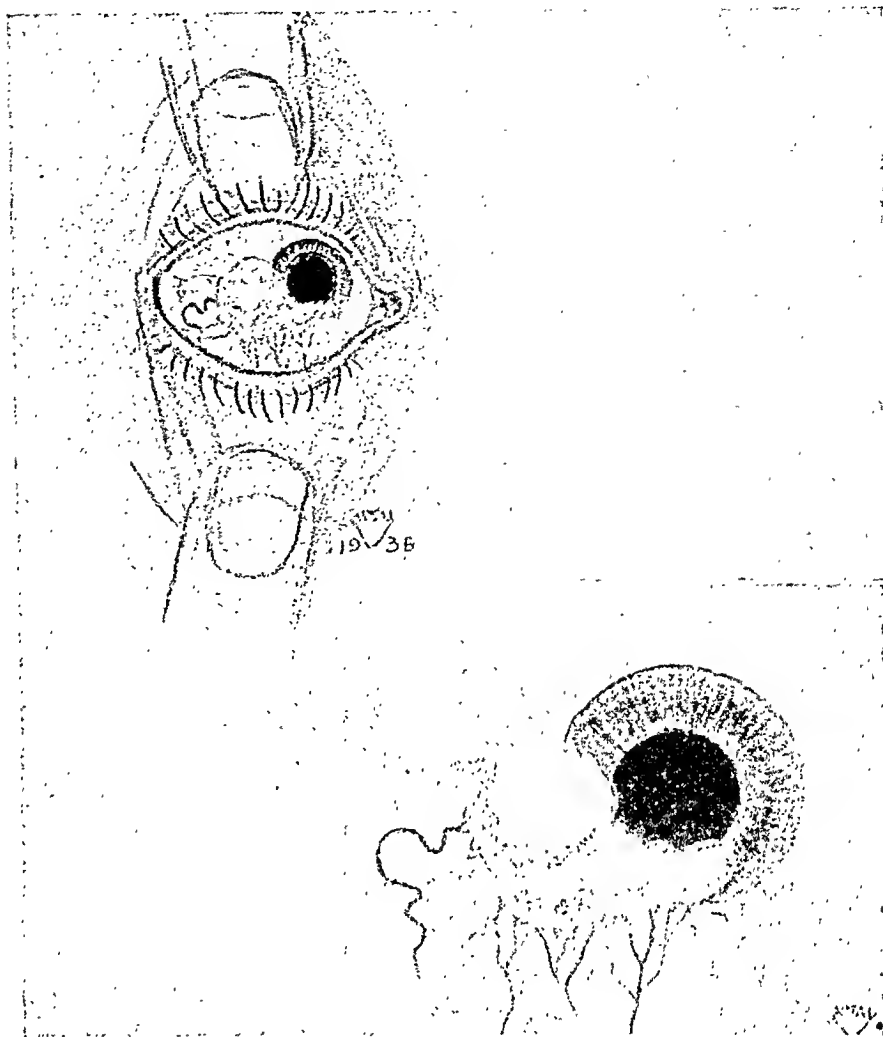


Fig. 5 (Buffington).

ful. The specimen was pronounced to be an epithelioma of papillomatous type or a papilloma taking on epitheliomatous changes. He was given X-ray exposures at intervals over a period of six weeks and when seen a year later the entire conjunctiva was smooth and glistening with no semblance of a recurrence.

DR. NORMAN W. PRICE, Niagara Falls, New York: Mr. R. J. came to my office August 12, 1937, with a growth at the 9-o'clock position at the limbus of his left eye. This was a flat growth extending a short distance over the cornea. With a cataract knife I removed the growth, which was only slightly raised and contained no pedicle. It was sent to the laboratory at Memorial Hospital, Niagara Falls, and also to Gratwick Laboratory,

Buffalo. They reported the growth a papilloma.

The patient returned in two weeks with a growth quite as large as the one before. I then took him to the Gratwick Cancer Laboratory, where they tried to remove the growth with an electric cautery on different occasions, but it returned soon after each treatment. On November 10, 1937, the growth was very much in evidence.

On March 7, 1938, at the hospital, I removed the growth thoroughly with a knife and cauterized the base with trichloroacetic acid, covering the area with a conjunctival flap. Another biopsy at this time showed a papilloma.

A month later the growth was quite as large as ever, and as Gratwick refused to use radium I did a thorough job of cauterizing, burning the tissues, all I thought the eye could stand, and again covering with conjunctiva. Since then there has been no recurrence. Vision corrected is 20/30.

DR. LAWRENCE T. POST, Saint Louis, Missouri: I wish to express agreement with the essayist in the value of the thermophore in the treatment of tumors of the type described. In our office we have been using the thermophore in these cases, and also in the clinic at Washington University for the past 20 years. We have had excellent success and have had very few recurrences. I believe the reason one has fewer recurrences in treating with the thermophore is because heat from the thermophore penetrates farther than in other types of cauterization, though, as the essayist said, penetration probably is limited to about $1\frac{1}{2}$ mm.

I would take exception to his statement about malignant growths. We have found that they were equally successfully treated by the thermophore. We find that depending upon the condition of the tissue with regard to its relationship to scar

tissue, it tends to be unsuccessful. The softer, the newer the growth the more successful is the thermophore application.

About three years ago an essay or thesis before the American Ophthalmological Society pointed out that the degree of heat did not register accurately in a series of thermophores that the author tested. Dr. Shahan recently has gone over this and found that statement to be correct. He has recently devised a new thermophore that is far more accurate. I think that a number of failures in thermophore therapy in its various applications may have been due to the inaccuracy of the thermometer in the instrument. It is possible to standardize your own thermophore by utilizing the fact that the melting points of drugs are relatively critical, within the matter of a degree or more. For example, the melting point of trional is given as 168.8°F . If you place a few crystals on the contact surface of your thermophore and set it for that temperature, you will find that though melting point and recrystallization are within one or two degrees, it may not read 168.8° on your thermophore. Therefore with such a method—there are other drugs for other temperatures—you can determine with fair accuracy the error in your own thermophore. We hope that the new one will be far more accurate.

I congratulate the essayist on the success that he has had. I might say that the temperature we have used is 150 degrees for one minute, remembering always that it is necessary to make continual contact during that minute.

DR. R. E. WINDHAM, in closing: I wish to express my deep appreciation to all the discussers for the very interesting and, to me, enlightening remarks that they have made.

I first used the thermophore on these growths experimentally. I had a case of one of the smaller groups, I think it was

the third case I had, and used the thermophore merely to see what would happen. I used a tip larger than the growth and held it for one minute by the watch, raised

my tip to see what had happened to the tumor and found I didn't have a vestige of it left. I thought I had found something. Thank you very much.

RETINAL HEMORRHAGES AFTER TRANSFUSION

RAYMOND J. GRAY, M.D.

Pittsburgh, Pennsylvania

Numerous complications of blood transfusion are described in the literature. Among these are the ocular complications, especially retinal hemorrhages, which form a group that is uncommon and least understood but which are in need of further investigation to determine their true relationship.

The possibility that retinal hemorrhages may occur as a complication of blood transfusion was first mentioned by Sallmann in 1925. The purpose of substantiating this possibility, and its frequency as well, formed the basis for a review of the literature and for the following observations, which were made in the Department of Ophthalmology at the Cincinnati General Hospital. None of the cases was selected and all were examined only as my colleagues on various services, coöperating with me, provided the opportunity to examine the fundi prior to the transfusion. Fundus examinations, therefore, were made before and 24 hours after. In cases of multiple transfusions, repeat examinations were made every 48 to 72 hours. Thus, accurate data could be compiled as to the presence of retinal hemorrhages before, and any appearance or increase after. Special note was also made of their extent, number, location, and if strictly retinal or preretinal. Eighty-five cases totalling 343 transfusions comprised the series studied. Individual cases received from 1 to 17 transfusions and of the total of 85, 69 received two or more.

In all, there were 44 different diagnoses but only one primary anemia; however, 68 cases were complicated by some degree of secondary anemia which would be expected in any transfusion series. Table 1 indicates the different diagnoses and number of each.

In the entire group, retinal hemorrhages were present in six cases prior to the first transfusion. Only one of this subgroup showed an increase in their number and size after transfusion. The only other positive case was one in which the retinae were normal at the time of the initial examination but in which bilateral preretinal hemorrhages obscuring the macula followed the transfusion. The significant details of both cases are herewith presented.

CASE REPORTS

Case 1. A white male, aged 58 years, had a final diagnosis of nontropical sprue.

On May 9, 1938, the blood count showed: erythrocytes, 890,000; hemoglobin, 28 percent. The blood pressure was 105/60.

Ophthalmoscopic examination: The discs and margins were of normal color; the maculae also were normal. There was marked vascular sclerosis. A few flame-shaped peripapillary hemorrhages (bilateral) were found; round, old and new, preretinal hemorrhages, about $1\frac{1}{4}$ disc diameters in size; two in the right and three in the left eye.

A transfusion of 250 c.c. of citrated

blood was given without reaction; patient was of type 2, the donor, type 4.

On May 10, 1938, the blood count

TABLE 1
PATHOLOGIES FOR WHICH TRANSFUSIONS
WERE GIVEN

Diagnoses	No. of Cases
Chronic osteomyelitis with anemia	7
Appendicitis with peritonitis	6
Traumatic shock	6
Incomplete abortion	5
Tubo-ovarian abscess	4
Thermal burns	4
Duodenal ulcer with anemia	3
Cholecystitis	3
Meningitis (pneumococcic)	3
Postpneumonic empyema	2
Chronic nephritis with anemia	2
Intestinal obstruction	2
Diabetes mellitus with anemia	2
Syphilis with arsenical dermatitis	2
Carcinoma of	
oesophagus	3
stomach	1
cecum	1
colon	1
rectum	2
breast	1
lung	1
pancreas	1
Compound fracture with gas gangrene	1
Prostatic hypertrophy	1
Postpartum hemorrhage	1
Pernicious anemia	1
Pyonephrosis with anemia	1
Perirenal abscess	1
Pyarthrosis	1
Pregnancy with pyelitis	1
Rupture of spleen	1
Spinal-cord tumor	1
Brain tumor	1
Pituitary tumor	1
Intracranial aneurysm	1
Pneumonia	1
Pemphigus	1
Pulmonary tuberculosis	1
Rheumatic heart disease with anemia	1
Orbital cellulitis	1
Little's disease	1
Carbuncle of cervical region	1
Urethral stricture with urinary extravasation	1
Uterine fibroids	1
Nontropical sprue	1
Total	85

showed erythrocytes, 1,030,000; hemoglobin, 33 percent. The ophthalmoscopic examinations revealed no change from the previous day.

A transfusion of 500 c.c. of citrated blood was received without reaction by

the patient; the donor, type 2. On the following day (May 11, 1938) there was a rise of temperature to 103 degrees, explained by the attending clinician as due to the transfusion of the previous day. The patient complained of blurred vision. His blood count was—erythrocytes, 1,250,000; hemoglobin, 35 percent.

Ophthalmoscopic examinations revealed an increase in the number and size of the preretinal hemorrhages with a fresh one, 1 disc diameter in size, obscuring the macula of the right eye, and a fresh one, 2½ disc diameters in size, obscuring the macula of the left.

On May 15, 1938, the vision (with glasses) was O.D. 20/200; O.S. ability to count fingers at 1 foot. On May 27, 1938, vision was O.D. 20/70; O.S. 10/200.

Ophthalmoscopic examinations showed the hemorrhages to be darker in color and absorbing; the right macular hemorrhage was 0.1 disc diameters in size; left, about 0.8 of a disc diameter.

On June 29, 1938, the vision was O.D. 20/40; O.S. 20/200; three months later (September 30, 1938) it was O.D. 20/20; O.S. 20/30.

Ophthalmoscopic examinations then showed the hemorrhages in the retina of the right eye to have been entirely absorbed, leaving the macula normal. The hemorrhages in the left eye had also been absorbed, but the macular area showed a grayish area about 0.25 of a disc diameter in size, surrounded by a dark-brown halo.

Case 2. A white male, aged 26 years, was given a final diagnosis of bleeding duodenal ulcer.

On December 2, 1937, the blood count showed erythrocytes, 1,450,000, and hemoglobin, 25 percent. The blood pressure was 100/65.

An ophthalmoscopic examination disclosed normal discs and maculae, vessels showing no recognizable degree of

sclerosis, and no hemorrhages nor exudates.

A transfusion of 550 c.c. of citrated blood was given, patient and donor both being type 4.

On December 3, 1937, the erythrocytes had decreased to 1,430,000 the hemoglobin remaining at 25 percent. A transfusion of 400 c.c. of citrated blood was given by a donor, type 4. This was followed in one hour by a severe post-transfusional reaction: a chill and temperature of 107°F.⁴

Upon ophthalmoscopic examination, fresh bilateral preretinal hemorrhages were found, each about 1 disc diameter in size.

On December 6, 1937, a transfusion of 500 c.c. of citrated blood was given; the donor, type 4. Ophthalmoscopic examination showed no increase of hemorrhages. On December 30, 1937, the blood count showed erythrocytes, 4,010,000; hemoglobin, 70 percent. The vision was O.D. 20/200; O.S. 20/200.

Ophthalmoscopic examinations showed the macular hemorrhages to be absorbing, reducing them to one third of a disc diameter in the right eye and one-half disc diameter in the left. On the next day (December 31, 1937), a fourth transfusion of 500 c.c. of citrated blood was given, using the original donor. A month later (February 2, 1938), the vision was O.D. 20/25; O.S. 20/20. An ophthalmoscopic examination showed that the hemorrhages had been totally absorbed; the maculae were normal.

COMMENT

In both cases, the hemorrhages were mainly preretinal with a predilection for the macular zone. In case 1, the hemorrhages absorbed slowly, the vision returning to normal only after an interval of about five months. This delayed return of normal visual acuity is compatible with the condition found upon analyzing

the case further; that is, first, the presence of a marked retinal arteriosclerosis; second, the retinal hemorrhages occurring in the course of a disease that is wasting in type.

In case 2, the return of visual acuity to normal was more rapid, requiring about two months. This prompt return of normal vision by reason of rapid complete absorption of the hemorrhages is easily understood by recalling that they occurred in a younger individual, suffering from a less emaciating disease and, furthermore, free of any recognizable arteriosclerosis. The return to normal vision in both cases is not to be questioned because it is surprising how completely preretinal hemorrhages usually become absorbed without residual evidence of their former location and extent. This occurs in spite of their tendency to extravasate and be profuse.

A review of the literature revealed that Sallmann,¹ as previously mentioned, was the first to report this complication. It is important to note that in none of his three cases was the fundus examined prior to the transfusion. The absence of retinal hemorrhages at that time was based on the fact that all three patients complained of blurred vision, not before, but immediately after the introduction of blood. These cases, including those of other authors, are listed in table 2.

Schaly² in 1926 reported four cases of identical nature. But again, it must be emphasized that fundus examinations were not made prior to transfusion in three cases and that the absence of retinal hemorrhages was based on the same assumption as Sallmann's. The fourth case was observed among a group of six that were studied with the sole purpose of noting any relation between blood transfusion and retinal hemorrhages. One had hemorrhages before with no increase after; three had none before or after; and the only positive

case was one in which the retinae before were free from hemorrhage.

In 1931, Messinger and Eckstein³ reported a series of 60 cases in which fresh retinal hemorrhages were seen 12 to 24 hours after transfusion in 10 cases, an incidence of 16 percent. Their results will be studied in more detail when com-

there was some debate as to the role played by the transfusion.

All the positive cases including mine and a single case reported by Borsotti⁶ are analyzed in the following table.

The question naturally arises as to the true role played by the transfusion *per se*. Even a cursory glance at table 2 reveals

TABLE 2
DATA ON REPORTED CASES OF FUNDUS CHANGES FOLLOWING BLOOD TRANSFUSION

Author	Diagnosis	Age years	Fundoscopy prior to Transfusion	Hemorrhages		Involve-ment at Maculae	Erythrocytes and Hemoglobin	Reac-tion
				Before	After			
Sallmann	Pernicious anemia	52	No	?	+	+	1,300,000	—
Sallmann	Pernicious anemia	53	No	?	+	+	690,000	—
Sallmann	This case presented not in detail but in gross aspect only							
Schalj	Pernicious anemia	40	No	?	+	+	1,290,000	25% —
Schalj	Aplastic anemia	27	No	?	+	+	260,000	15% —
Schalj	Aplastic anemia	?	No	?	+	+	690,000	14% —
Schalj	Pernicious anemia	40	Yes	—	+	+	940,000	23% —
Messinger and Eckstein	Acute lymph. leukemia	4	Yes	+	+	+	3,220,000	60% —
Messinger and Eckstein	Lymph. leukemia	8	Yes	—	+	—	1,220,000	20% —
Messinger and Eckstein	Lymph. leukemia							
Messinger and Eckstein	Purpura hemorrhagica	26	Yes	—	+	+	1,450,000	30% —
Messinger and Eckstein	Essential menorrhagia	19	Yes	—	+	—	1,700,000	40% —
Messinger and Eckstein	Incomplete miscarriage	33	Yes	—	+	—	1,430,000	25% —
Messinger and Eckstein	Fibroid uteri	50	Yes	—	+	—	1,220,000	10% —
Messinger and Eckstein	Banti's disease	12	Yes	—	+	—	1,150,000	—
Messinger and Eckstein	Carcinoma stomach	55	Yes	—	+	—	3,000,000	40% —
Messinger and Eckstein	Carcinoma cervix	49	Yes	—	+	—	2,500,000	40% —
Titov and Bogomolova	Pernicious anemia	?	Yes	+	+	?	830,000	22% —
Titov and Bogomolova	Pernicious anemia	?	Yes	+	+	?	690,000	12% —
Titov and Bogomolova	Hemorrhagic purpura	?	Yes	+	+	?	3,900,000	60% —
Titov and Bogomolova	Circulatory insufficiency	?	Yes	+	+	?	1,330,000	20% —
Titov and Bogomolova	Myocarditis	?	Yes	+	+	?	1,740,000	11% —
Titov and Bogomolova	Sepsis	?	Yes	+	+	?	1,120,000	20% —
Titov and Bogomolova	Gastric ulcer	?	Yes	—	+	?	3,800,000	63% —
Borsotti	Secondary anemia	34	No	?	+	+	1,530,000	48% +
Gray	Nontropical sprue	58	Yes	+	+	+	1,250,000	35% —
Gray	Gastric ulcer	26	Yes	—	+	+	1,450,000	25% +

paring them with those obtained by me and by Titov and Bogomolova.⁴ The latter investigators studied 100 cases, the largest series of all, and found only seven positive cases, an incidence of 7 percent.

Frey⁵ has noted the occurrence of massive retinal hemorrhages following transfusion in several cases of leukemia and pernicious anemia. Routine ophthalmoscopic examinations previously had shown no hemorrhage. He adds that

that a large percentage of cases belong to the blood dyscrasias and that the remaining ones are complicated by a pronounced secondary anemia. Hence a retinosis due to deficiency of erythrocytes, irrespective of transfusion, is to be expected, and this is verified by the frequent finding of such at the time of the initial ophthalmoscopic examination. Therefore, the possibility that the hemorrhages appear coincidentally is likely. In

view of this, I do not believe that we can ascribe a major etiological role to the transfusion *per se*, and only further investigation will reveal whether a true etiological relationship does exist.

Chutko⁷ and Titov and Bogomolova⁴ also believe that transfusions do not form a basic etiology of retinal hemorrhages, but might, in the presence of other factors predisposing to them, either initiate or increase the size and number.

The observations of Messinger and Eckstein were more positive in their cases; the transfusion played a greater role. This is further emphasized by the fact that three of their cases showed an increased number of hemorrhages after the second transfusion. They conclude that retinal hemorrhage in some degree is a frequent sequel to blood transfusion.

Granting that transfusions do play an etiologic role, even though minor, an attempt must be made to explain their pathogenesis. Sallmann refers to the retinal hemorrhage as a retinal apoplexy and believes it to be merely mechanical from a sudden increase of volume which in turn increases the blood pressure. He further added that the retinal hemorrhage *per se* occurred by rhexis. This belief is substantiated by the frequent occurrence of the diffuse preretinal type.

Schaly agrees with the transfusion hypertension theory, but differs in his opinion by stating that the retinal hemorrhages occurred by diapedesis. The transfusion hypertensive factor would be extremely variable, the increase of pressure depending on several conditions; for example, volume and pressure of blood before transfusion, state of vascular structure and tonicity, volume of blood transfused, rate of transfusion, and such factors. Both agree, however, that a slight increase would be sufficient, especially in the presence of vascular disease. Supporting this latter statement is the finding that no positive results were

observed in any case of acute anemia, postoperative or traumatic, but only in the chronic cases in which some degree of vascular degeneration with increased permeability would be expected. Therefore, a mechanical factor as such is plausible and cannot be denied. In this event, one would expect the hemorrhage to occur during or immediately after the transfusion. However, this does not seem to be true if the time of the patient's complaints can be taken as a criterion, unless the hemorrhage begins beyond the macula and finally produces a positive scotoma by direct extension. I agree with Borsotti that transfusion hypertension is not the primary factor. If such were the case, retinal hemorrhages could be expected to occur after saline or glucose infusions. No direct observations have been made on this problem, but it probably does not occur.

Sgrosso⁸ indicated an embolic closure of capillaries as the reason for retinal hemorrhages. This also must be considered plausible, especially in cases exhibiting posttransfusion reactions of a systemic nature. The basis for this type of reaction resolves itself into the consideration of errors of technique and incompatibilities. Among the latter may be stressed the diet of the donor which, according to Price,⁹ plays an important part in the production of reactions. The problem of sensitization is yet to be studied, but it is interesting to note that in some cases the hemorrhages were seen only after repeated transfusions.

CONCLUSIONS

1. A definite etiological relationship of transfusions to retinal hemorrhages cannot be stated with certainty at the present time.
2. Retinal hemorrhages following transfusions have occurred only in those cases in which a preëxisting condition itself predisposed to them.

3. An etiological role, if any, is certainly minor in action. rhages is not a serious complication although Schaly considered the opposite to be true.
4. Further investigation and observation must be carried out in this phase.
5. The occurrence of retinal hemorrhages is not a serious complication although Schaly considered the opposite to be true.

212 Bigham Street.

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ISOLATED RHEUMATIC NODULE OF THE UPPER EYELID*

REPORT OF TWO CASES

JACK S. GUYTON, M.D., AND JOHN M. McLEAN, M.D.
Baltimore

During the past three years two cases, each presenting an unusual type of nodular tumor of the upper eyelid and brow, and apparently rheumatic in nature, have been encountered in the Wilmer Institute. Considering the rather common occurrence of rheumatic fever and the relative frequency of rheumatic nodules elsewhere in the body, it may well be that nodules such as these have thus far been unrecognized by the ophthalmologists. Because of the interesting clinical and pathological possibilities that have arisen in these cases, and because no description of similar cases can be found in the literature, the following report is made.

REPORT OF CASES

Case 1. D. S., a 4-year-old colored boy, first came to the Wilmer Dispensary on June 16, 1938, with a history of a small swelling of the external part of the right upper lid of two weeks' duration. The family history was non-contributory.

The patient was born at term in the Johns Hopkins Hospital on September 7, 1934, and suffered a birth injury resulting in partial right brachial-plexus palsy. When he was eight months old he was admitted to the Pediatric Service with meningococcus septicemia and arthritis, but no meningitis. He soon recovered completely from this. An unexplained slight enlargement of the heart to the right was noted at that time. Always quite healthy since then, he has never had cough, shortness of breath, fever, nor any other systemic symptoms.

Physical examination revealed a small, hard, freely movable mass at the external rim of the right orbit beneath the brow, with several small "shotty" masses adjacent to it in the lateral portion of the upper lid (fig. 1). The results of the remaining ocular examination and general physical examination were otherwise normal except for the old brachial palsy. Repeated X-ray studies of the right orbit showed normal bony structure and no abnormalities. During the course of the next six weeks the masses seemed to become larger and less freely movable. The patient was admitted to the Wilmer Institute on August 3, 1938, and the tumor removed under ether anesthesia. It had no definite capsule and was partially adherent to the overlying skin and also to the periosteum of the upper lateral rim of the orbit.

Description of specimen. Gross: The specimen measures approximately 35 by 10 by 8 mm., and consists of a fibrous mass containing numerous small nodular elements; it is not encapsulated.

Microscopic: In the section five or six confluent nodular lesions (fig. 2A) can be made out, averaging approximately 2 mm. in diameter. These are surrounded by connective tissue and are not well demarcated. The typical nodular lesion has a necrotic center, the necrosis being of a "dry," acidophilic type, consisting principally of degenerated swollen collagen fibrils, with some fibrin deposition and a few picnotic nuclei present in some areas. The cells surrounding this necrotic center are arranged predominantly in radial fashion (fig. 2B). From their appearance, they may be either modified fibroblasts or

* From the Wilmer Ophthalmological Institute of the Johns Hopkins Hospital and University.

macrophages. The nuclei are in general slightly larger than in normal fibrocytes, oval, with a moderate reticulum, and usually no definite nucleoli, and there are many more nuclei as compared with cyto-



Fig. 1 (Guyton and McLean). Small tumor over upper outer rim of orbit; case 1.

plasm than in normal connective tissue. With the Mallory connective-tissue stain, only a very few collagen fibrils can be demonstrated among these cells, and these fibrils have an orderly, arching arrangement that suggests that they have been infiltrated by, rather than formed from, the inflammatory cellular elements. This stratum of cells, which varies greatly in thickness and contains few vessels, merges indefinitely into the surrounding connective tissue. The connective tissue in places appears to be normal subcutaneous tissue and contains few vessels, but in other places it is irregular and contains numerous newly formed capillaries. The lesion is not confined to the formation of definite nodules—in some areas of the section there is simply an irregular degeneration of bundles of collagen fibrils,

with an infiltration of cells between the degenerated bundles similar to those surrounding the circumscribed necrotic zones. There is a very slight diffuse infiltration of some areas with lymphocytes and plasma cells, but these are an inconspicuous part of the picture. The appearance of the vessels varies greatly in different parts of the section. There are a number of newly-formed capillaries, but many of the remaining vessels appear to be essentially normal. Some of the arterioles exhibit proliferation of the endothelium and thickening of the intima, and there is complete obliteration of the lumen of a few of the smaller arterioles. The largest arteriole in the sections (see figure 3) presents a remarkable proliferation of cells similar to those surrounding the necrotic lesions—these cells appear to originate from the endothelium. There is no perivascular infiltration in any part of the sections. No giant cells, epithelioid cells, polymorphonuclear leucocytes, nor xanthoma cells are seen anywhere.

In view of the etiologic possibilities in the production of nodules of this type—that is, rheumatic fever, rheumatoid arthritis, syphilis, yaws, and granuloma annulare—the patient's condition was investigated more fully from the medical standpoint. Repeated physical examination revealed that the heart was entirely normal except for a questionable faint systolic murmur in the pulmonic area, the joints were entirely normal except those affected by the old brachial palsy, no nodules were present over any other part of the patient's body, and nothing suggestive of congenital syphilis or of chorea could be found. Repeated blood Wassermann reactions were negative (as was serological examination of the mother before the patient's birth). An electrocardiogram was normal. A teleoroentgenogram revealed no enlargement of the heart. Corrected sedimentation rate, however, was

found to be 28 mm. for one hour. While the patient was in the Wilmer Institute, his heart rate varied between 90 and 100

since been followed in the Dispensary. He was last examined on October 10, 1938. At that time there was no recur-

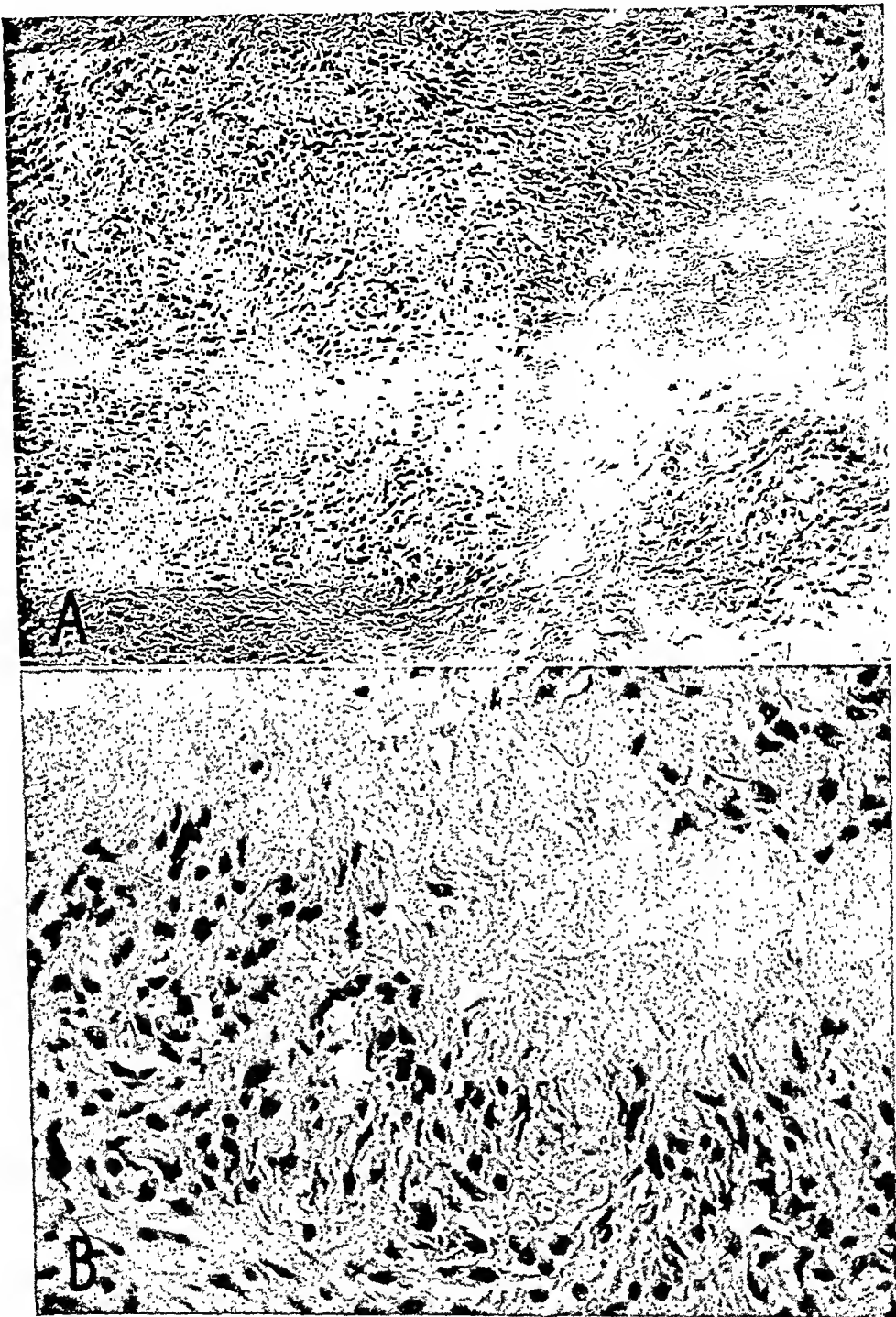


Fig. 2 (Guyton and McLean). A, nodular lesion with necrosis; case 1. Hematoxylin and eosin stain, $\times 90$. B, edge of a necrotic area; case 1. Hematoxylin and eosin stain, $\times 320$.

and his temperature between 99 and 100. He was not cutaneously sensitive to even 1 mg. of old tuberculin. The patient was discharged on August 15, 1938, and has

rence of nodules in the right upper lid, no nodules were present over any other part of the body, the heart and lungs were entirely normal, the joints were normal



Fig. 3 (Guyton and McLean). Endothelial proliferation of a large arteriole. Verhoeff-van Gieson stain, $\times 430$.

except for the old birth injury, there was no evidence of chorea, and corrected sedimentation rate was 16 mm. per hour. The patient had a slight cold at that time.

Case 2. H. B., a colored boy born November 14, 1933, was first seen in the Wilmer Dispensary on November 18, 1935, with a history of a small lump in the right upper lid near the outer canthus which had appeared three weeks previously and gradually increased in size. The family history was non-contributory.

The patient was first seen in the pediatric service of the Johns Hopkins Hospital at the age of four weeks because of a feeding problem. Physical examination at that time revealed nothing abnormal. Blood Wassermann reaction of the mother was negative. Following this he was always quite healthy except for a few colds.

Physical examination revealed a firm, well-defined mass above the outer canthus of the right eye, lying just in front of the upper temporal orbital rim but not attached to it. It measured approximately 15 by 8 mm. in size and protruded about 5 mm., with the skin freely movable above it. The results of the remaining ocular examination were normal, and of the general physical examination were entirely normal except for a finding of hypertrophied tonsils. X-ray studies of the right orbit showed no abnormality. Roentgenograms of the chest, electrocardiogram, and the determination of the sedimentation rate were not made. The patient was admitted to the Wilmer Institute and the tumor removed on November 21, 1935, under ether anesthesia. Convalescence was uneventful.

Description of specimen. In all essential details, these sections (fig. 4A, B, C) are histologically identical with those of case 1. There are a few minor variations, as follows: There is somewhat more deposition of fibrin in the necrotic areas; the connective tissue surrounding the discrete lesions is more irregular in appearance; arterioles present more subendothelial proliferation, with obliteration of the lumen of a larger number of them; and there is a small amount of perivascular infiltration with lymphocytes, plasma cells, and a few polymorphonuclear leucocytes.

The patient was not seen again until June 27, 1936, when he was seen in the Pediatric Dispensary because of a contusion of the ear. Except for this and a mild cold, a complete physical examination performed at that time was entirely negative for pathology. Following this

visit the patient did not return, and recent attempts to find him for further examinations have been unsuccessful.

COMMENT

The nodules described belong to the group of subcutaneous fibroid nodules usually referred to as the "juxta-articular type." They were first noticed in cases of rheumatic fever, and were considered pathognomonic of that disease until the latter part of the nineteenth century, when cases were noted in which there were no demonstrable signs of rheumatism. Since then it has become evident that they may occur in connection with rheumatic fever, rheumatoid arthritis, syphilis, and probably yaws and granuloma annulare.

Dawson and Boots¹ in 1930 emphasized the occurrence of these nodules in rheumatoid arthritis. They were found in 40 out of 200 such cases and varied in size from scarcely palpable nodules to those the size of olives. They were most common on the dorsum of the forearm, but also appeared over the olecranon itself, in the wall of the olecranon bursa, and over the dorsum of the hands, the knees, the sacrum, and the scalp. They were not attached to the skin or periosteum, but frequently were related to tendon sheaths and walls of bursae. They usually developed slowly and persisted for years, but sometimes small ones ran a course of only a few weeks. Dawson and Boots examined histologically nodules from 14 of these patients, and reported the following essential features: 1. Area of central necrosis, apparently due in the earliest stages to a gelatinous swelling and disintegration of collagen bundles. Depending on the age of the nodule and severity of the process there was a variable amount of fibrin deposition and inflammatory-cell

infiltration. 2. Surrounding zone of characteristically arranged large mononuclear cells, usually in radial arrangement. 3. Enclosing zone of relatively avascular fibrous tissue. 4. Absence of changes in the blood vessels of the nodule itself. However, in the surrounding arterioles there were often subendothelial hyperplasia and deposition of fibrin, splitting or reduplication of the elastic lamella, and perivascular infiltration with large mononuclear and small round cells. These authors expressed the belief that similar nodules are found only in rheumatic fever and rheumatoid arthritis. They were unable to culture any bacteria from the nodules.²

Swift³ in his classic review of rheumatic fever points out that often only one type of manifestation of rheumatic fever may be apparent in a patient for a long period of time, and that this fact supports the conception that chorea or subcutaneous nodules occurring in the absence of any other rheumatic symptoms may be rheumatic in nature. He points out that in early stages of the nodules in rheumatic fever there may be some polynuclear cells closely resembling the "irritation giant cells" of the Aschoff bodies.

Hopkins⁴ in 1931 presented a summary of this type of nodule in general. In his opinion considerable confusion had been created as to the etiology because some authors had stressed syphilis as an etiologic factor, as opposed to the beliefs of Dawson and Boots. He reported from the Syphilis Clinic of the Johns Hopkins Hospital 14 cases with subcutaneous nodules of the juxta-articular type. Two of these patients had rheumatoid arthritis, and in them the nodules did not disappear with antisyphilitic treatment. The others showed no sign of rheumatic fever or rheumatoid arthritis; eight of these returned for adequate antisyphilitic treatment, and in these the nodules promptly

disappeared. The histological picture of these nodules was indistinguishable from that of nodules from rheumatoid arthritis. No spirochetes could be found, and one rabbit inoculation was negative. He cited several attempts by other investigators at rabbit inoculation, with one positive result by Jessner and Rosiansky after a double passage.

The description given by the Harvard Expedition⁷ of the nodes in yaws is quite

similar to those given by Jessner⁶ and others of the nodes in syphilis, and the descriptions of rheumatoid nodules by Dawson and Boots. They noted the constant occurrence of numerous xanthoma cells in their specimens, however, and the photomicrographs included in their report differ somewhat in appearance from those of the syphilitic, rheumatic, and rheumatoid nodules we have examined. Jessner, however, reports the occasional

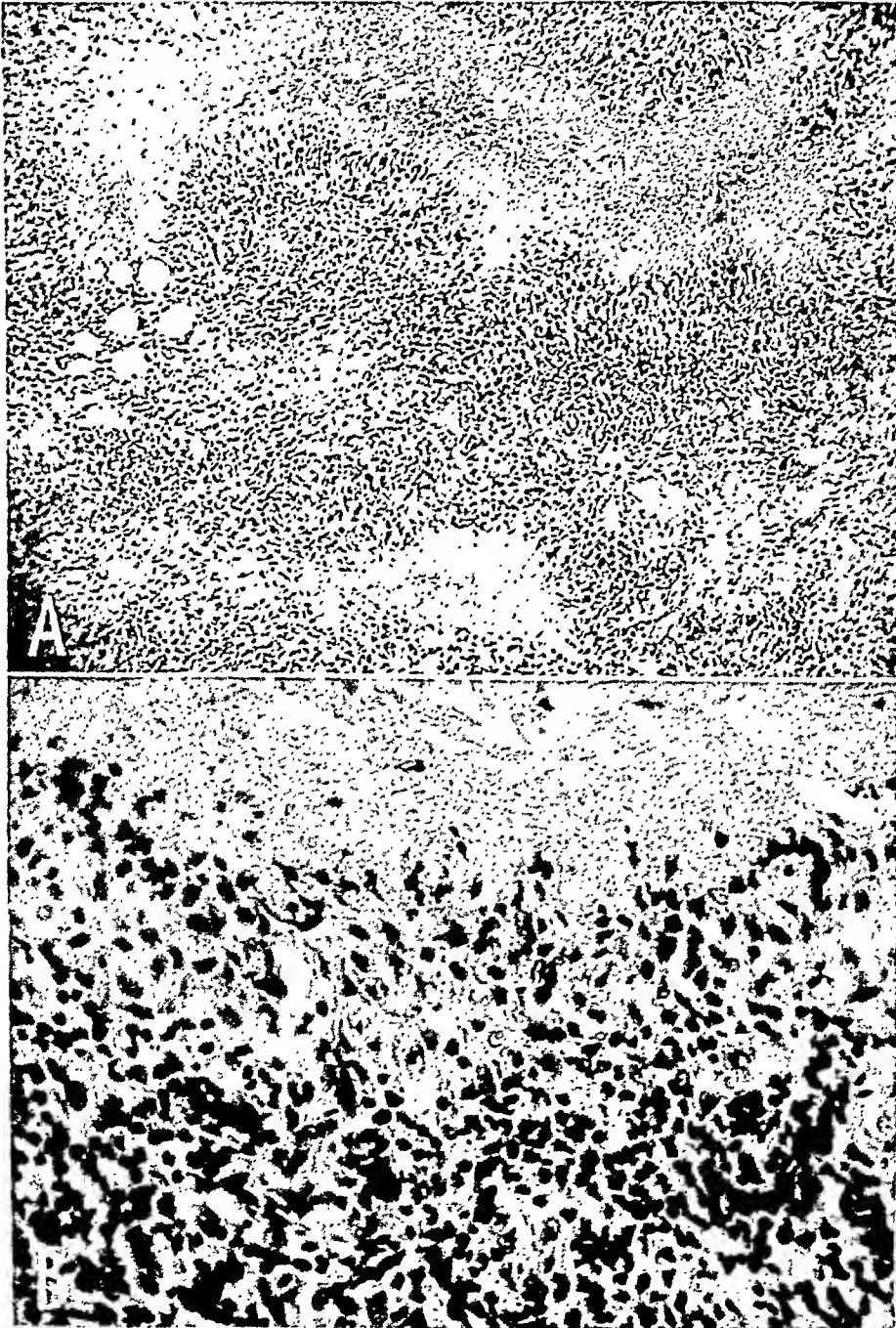
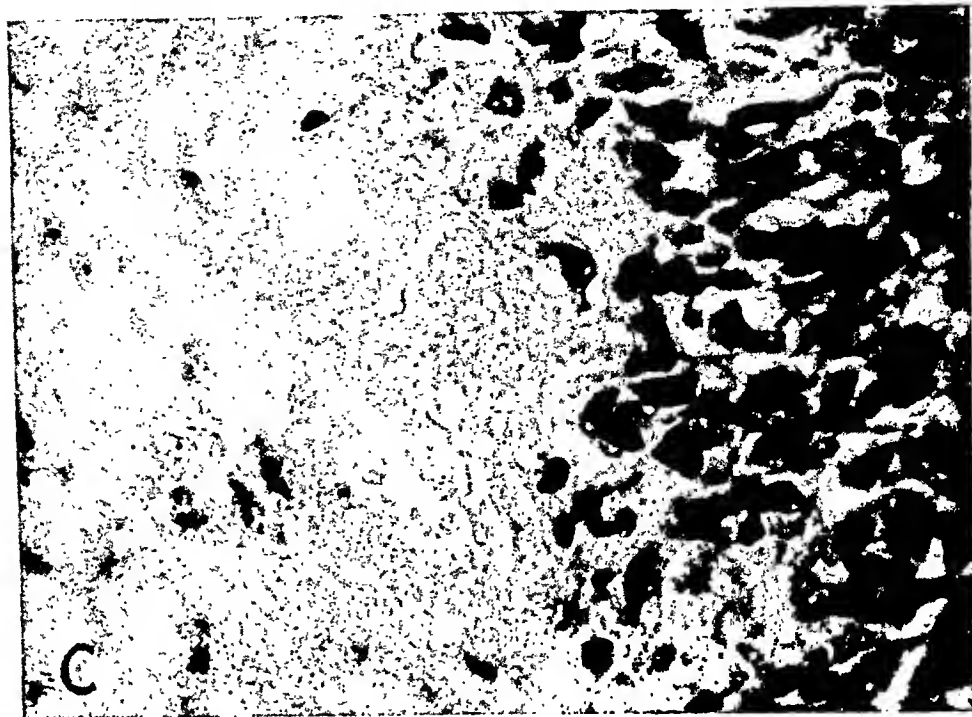


Fig. 4 A (Guyton and McLean). Nodular lesion with necrosis; case 2. Hematoxylin and eosin stain, $\times 90$.

Fig. 4 B (Guyton and McLean). Edge of a necrotic area; case 2. Hematoxylin and eosin stain, $\times 320$.

Fig. 4 C (Guyton and McLean). Cellular detail at edge of necrotic area; case 2. Hematoxylin and eosin stain, $\times 540$.



occurrence of xanthoma cells in luetic nodules, and says there may be considerable variation in the histological picture.

Goodman and Ketron⁷ in 1936 presented a summary of unusual cases of granuloma annulare and of its histological appearance. They concluded that this disease presents a characteristic histologic picture, particularly in the early stages, consisting of a granular degeneration of the connective tissue, followed by a cellular infiltration of large mononuclear cells of the macrophage type, which, with connective-tissue cells, tend to arrange themselves between the partially degenerated fibers or around the edges of circumscribed necrotic zones in a characteristic manner; in the later stages, they found that granuloma annulare resembles histologically the juxta-articular rheumatoid nodules, except that they found no vascular changes. Granuloma annulare is primarily a skin disease, easily distinguishable from our cases, but there have been a few cases of a subcutaneous variety reported. Goodman and Ketron prefer to regard these as not being true granuloma annulare, but there is considerable disagree-

ment on this point. A case reported as such by Grauer⁸ is of considerable interest in that it more closely simulates our cases than any other we have been able to find: A two-year-old white boy developed nodular subcutaneous lesions of the scalp and typical cutaneous granuloma annulare lesions of the left wrist and right tibia, all appearing during the preceding five months. History was otherwise essentially negative except for loss of three or four pounds and slight irritability since the onset of the lesions. Physical examination and X-ray studies were normal. The sedimentation rate was not reported. Biopsies were taken, and judging from the description and a photomicrograph the subcutaneous nodules of the scalp were histologically identical with those of our cases. The vessels were said to be "essentially unchanged except for moderate proliferation of the endothelium."

The case of dermatitis atrophicans with nodular formation reported by Ketron⁹ in 1913, which was classed as a juxta-articular nodule by Hopkins, appears to us to differ considerably from the rheumatic type of nodule. The case of gen-

eralized scleroderma with numerous subcutaneous nodules reported by Gray¹⁰ is given in too brief detail to be classified.

SUMMARY AND CONCLUSIONS

Two cases are reported in negro children, both of whom show isolated subcutaneous nodular inflammatory tumors, in the region of the upper lid and brow, of the histologic nature of "rheumatic" nodules. As the review of the literature indicates, such nodules may be: (1) the

sole manifestation of rheumatic fever, (2) a form of either syphilis or yaws, (3) an accompaniment of rheumatoid arthritis, or (4) a subcutaneous form of granuloma annulare. Since all but the first and last possibilities can be definitely ruled out in our cases, we are forced to conclude that they represent either a manifestation of rheumatic fever or the subcutaneous variety of granuloma annulare—which, after all, may be one and the same thing.

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THE NEED FOR SOCIAL SERVICE WORK IN GLAUCOMA*

AUGUST F. JENSEN, M.D.**

Grand Forks, North Dakota

AND

HARRY S. GRADLE, M.D.

Chicago

This is a study based on new cases of glaucoma admitted to the Illinois Eye and Ear Infirmary in-patient department between January 1, 1933, and January 1, 1937. None of the patients admitted before that time is now coming for treatment. All diagnosed in the out-patient department as glaucoma patients were sent to the hospital for admission; but many refused to go and, consequently, no out-patients are included in these statistics. This study was made to determine how many returned to the clinic for treatment and how long they continued treatment. Only the primary glaucomas are considered.

During this period 239 patients were admitted to the in-patient department of the Illinois Eye and Ear Infirmary. Of these, 133 were males and 106 were females. Their ages were as follows:

<i>Age</i>	<i>Number of Cases</i>
Between 1 and 10 years	0
Between 10 and 20 years	4
Between 20 and 30 years	0
Between 30 and 40 years	12
Between 40 and 50 years	25
Between 50 and 60 years	82
Between 60 and 70 years	67
Between 70 and 80 years	42
Over 80 years	7

The greatest number were in the fifties and sixties and consequently had a life expectancy of 15 to 20 years.

The cases were grouped into five types as follows:

* From the Illinois Eye and Ear Infirmary.
** Formerly Senior Resident at the Illinois Eye and Ear Infirmary.

<i>Type</i>	<i>Number of Cases</i>	<i>Both Eyes Involved</i>	<i>R.</i>	<i>L.</i>
Acute uncompensated ..	33	4	19	18
Chronic uncompensated .	3	1	2	3
Compensated	161	113	141	133
Absolute	41	11	30	22
Hydrophthalmos	1	1	1	1

In 130 cases both eyes were involved and in 109 only one eye was involved. Of patients with both eyes involved, the majority were over 50 years of age. Out of this group, there were only 33 cases of acute uncompensated and 3 cases of chronic uncompensated glaucoma.

Six of the patients were totally blind in both eyes when first seen; several were blind in one eye, and had only light perception in the other. In the 239 cases, 369 eyes were involved. Of those:

<i>Vision</i>	<i>Number</i>
Totally blind	74
Light perception	86
Hand movements to 20/200	104

In every case, the best possible vision with correction was recorded.

There was considerable variation as to the time the patient had noticed the onset of the condition before coming to the clinic. Many of them could not give a definite statement, for there had been a gradual loss of vision over a considerable period of time. The younger the patient the more definitely was the time of onset determined.

The length of time that elapsed between subjective onset of symptoms and first visit to the infirmary was found to be as follows:

<i>Time</i>	<i>Number of Cases</i>
Less than one month	19
One to six months	50
Six months to one year	28
One year to two years	40
Two years to three years	24
Three years to four years	19
Four years to five years	14
More than five years	5

Most of the patients had noticed that they had to have their glasses changed more often and finally they were not able to obtain sufficient visual improvement with a change of glasses. Quite a number of them were referred to the clinic for cataract operation, or had been diagnosed as cataract patients elsewhere and told to wait for operation until the cataracts were "ripe."

There were 296 hospital admissions. Of those:

<i>Number admitted</i>	<i>Number of Cases</i>
Only once	195
Twice	36
Three times	0
Four times	0
Five times	1
Six times	1

Of the 239 patients admitted, 171 were operated upon and 68 underwent no operation. There were 215 operations performed.

Twenty-nine percent of the patients operated upon were observed less than one month. Sixty percent were observed less than six months subsequent to operation. Of the 239 patients treated at the hospital during this time, 172 were treated less than six months. Of the patients treated, the duration of observation was as follows:

<i>Observation</i>	<i>Number of Cases</i>
Less than one month	88
One month to six months	84
Six months to one year	22
One year to two years	16
More than two years	19
Still coming to the clinic for observation .	8

One hundred and seventy-two or nearly 72 percent of the patients were observed less than six months. They were probably not going elsewhere for treatment, for in this group only one had been treated for glaucoma elsewhere before coming to the clinic. This patient had been treated at a private clinic and hospitalization was advised. She was unable to pay for the hospital care, so was referred here.

Three patients did not remain in the hospital long enough to be studied. In all of the cases admitted, the tension was controlled at the time of discharge.

Only eight of the patients admitted during this time are still coming to the clinic under observation. These have been coming regularly and have kept up their treatment.

Out of the 239 patients admitted to the hospital during the period from January 1, 1933, and January 1, 1937, only 67 returned to the clinic for observation following their hospitalization. One hundred and seventy-two patients received no further treatment.

We have no way of knowing of what value our treatment has been unless our patients return for follow-up work. One hundred and seventy-one patients were operated upon, 40 percent of whom were not seen at all after their discharge from the hospital. There is no way of knowing what operation gave the best results nor how long it was efficient. Of the entire group admitted during this time 72 percent did not receive care after discharge.

No matter how thorough our study or how well we were able to classify the case and outline the procedure of treatment, the patient has not been benefited as far as we know. These figures prove that *our clinical cases of glaucoma are not receiving the aftercare necessary to prevent almost certain blindness.* The percentage of blindness due to glaucoma varied throughout the world from 6.5

percent in the United States to 18 percent in some of the European countries. Such blindness is due to: (1) Lack of recognition of the disease until permanent damage has been done; (2) inadequate medical or surgical care; (3) failure to observe the patient sufficiently long to insure against the further loss of vision from hypertension.

This is not the place to discuss the first two aspects, although the third table in this paper could open the way. The question here is, "How can the third phase be eliminated as far as is humanly possible?"

The failure to observe glaucoma patients over a sufficient length of time must be attributed partly to the attending physician and partly to inherent negligence on the part of the patients. In a busy clinic, the physician has not the time nor the patience to sit down and explain painstakingly to the patient the character of the disease, the impossibility of improvement of vision beyond the existing conditions, the necessity of long-continued observation, and the importance of following medical or surgical directions implicitly. On the other hand, clinic patients are apt to be of a lower mental caliber and consequently cannot comprehend the situation. Furthermore they are apt to find no improvement in vision after weeks of

use of drops or after operation and they drop the whole matter, accepting the loss of vision as something inevitable. In addition, if the patient is the support of the family, a visit to the clinic consumes nearly a whole day, causing a loss of one fifth or one sixth of the weekly income, which is an economic factor that must be given serious consideration.

Much discussion along these lines is possible, but unnecessary, for the remedy is at hand, thanks to George Derby, who showed us the way. Adequate medical social service is the answer and thereby well over 80 percent of the third aspect of the problem can be solved.

Only in that or some similar way can we keep under necessary observation the cases of glaucoma that seem doomed to ultimate blindness from neglect. Medical skill can prevent a large share of blindness from glaucoma, but only if the patients are there for the doctors to work upon. No physician can prevent loss of vision from hypertension by absent treatment. Four years from now, we will make a similar report upon the management of glaucoma under the added control by Social Service, and we think it will be more cheerful.

904 West Adams Street.

OPHTHALMOMYIASIS INTERNA ANTERIOR*

REPORT OF HYPODERMA LARVA IN ANTERIOR CHAMBER

C. S. O'BRIEN, M.D., AND J. H. ALLEN, M.D.

Iowa City, Iowa

Rare indeed is the presence of a maggot in the anterior chamber of the human eyeball. Herewith is presented the first report of a case from the Americas; however, DeBoe¹ and Anderson² have each published an account of a larva in the vitreous chamber. The latter author gives a complete review of the literature to 1935 and only five cases^{3, 4, 5, 6, 7} involving the anterior chamber, none of which was reported from the Western Hemisphere, have been added to the 10 summarized by Anderson.

J. P., white, a schoolboy, aged six years, was referred by Dr. Robley Goad of Muscatine, Iowa, on September 28, 1938. There was no history of injury to the eye, but the patient had run a nail into his foot while walking through the barnyard on September 5th. On September 15th, the right eye became red, congested, and painful, and the next day, when seen by Doctor Goad, the crystalline lens appeared to be subluxated and the intraocular tension was 65 mm. Hg (Gradle-Schiötz). Pilocarpine 1 percent was ordered and the eye improved for several days, but the tension rose again and the child was referred for consultation on September 28th. On this date the right globe was painful and deeply congested, the cornea was clear, there were many cells in the aqueous, iridodonesis was present, the lens was subluxated, and the intraocular tension was elevated. During examination of the anterior segment with the loupe, a small elongated light-gray object (fig. 1) was seen near the pupillary margin,

extending from about the 1:00- to the 3:00-o'clock position. With the biomicroscope this appeared as a gray, translucent, cigar- or zeppelin-shaped object approximately 0.5 mm. in its greater diameter and 2.5 mm. in length. One end was blunt, rounded, and somewhat darker, while the opposite end was somewhat pointed. Extending upward from the pupil and encompassing the body was a small amount of vitreous. A diagnosis of larva in the anterior chamber was made. It appeared that the maggot had worked its way forward from the vitreous through the zonule and into the anterior chamber, carrying a small amount of vitreous with it. In this way only could one account for the subluxation of the lens and the presence of vitreous around the larva. The patient was advised to have an operation and the larva was removed by Doctor Goad on September 30th.

The larva was identified as that of *Hypoderma* by Charles T. Greene, associate entomologist in the United States Department of Agriculture. According to Riley and Johannsen⁸ *Hypoderma* is the botfly of sheep, ox, and deer; it is commonly known as the warble or heel fly of cattle. Two types are recognized, *Hypoderma bovis* and *Hypoderma lineatum*, but it is impossible to differentiate them in the first-stage larva.

The following report was received from the Department of Agriculture: "The first stage larva of *Hypoderma* when hatched from the egg measures from 0.55 to 0.65 mm. in length and from 0.15 to 0.18 mm. in width at its greatest diameter. The width is greatest at the posterior end, and the larva tapers to the head. It is

* From the Department of Ophthalmology, College of Medicine, State University of Iowa.

creamy or dull white in color and densely covered with spines on all segments, the anterior borders bearing the heaviest spines in transverse rows, followed usually by six rows of spines, more or less regularly placed, and slightly decreasing in size toward the posterior border of the segment. The anal segment differs from

are pointed at each end, especially the forward one, which terminates in a sharp point. A prominent inward-curving tooth is located about one third the length of the entire hook from the anterior tip. A stout, sharp spine directed forward projects slightly between the mouth hooks. The anterior spiracles appear as two minute

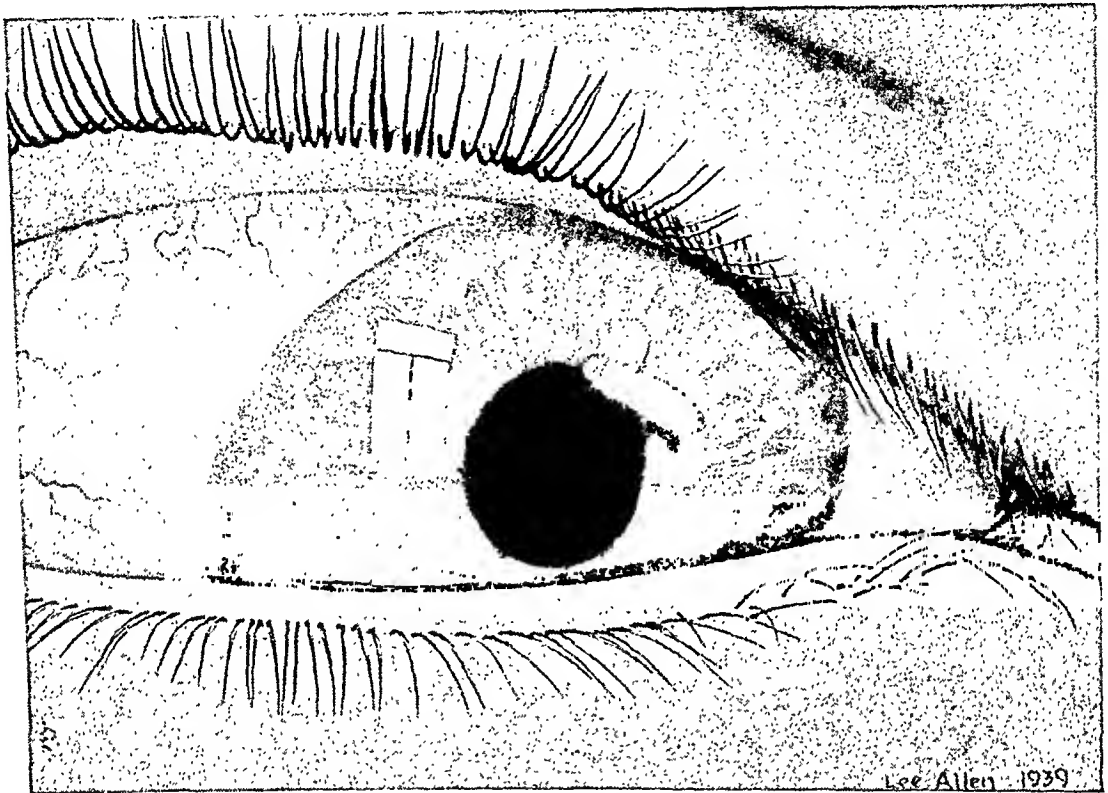


Fig. 1 (O'Brien and Allen). Hypodermis larva, partially surrounded by vitreous, in anterior chamber.

all those preceding in that it bears spines of three distinct types. The posterior spiracles, which are represented by two dark circular spots, are protected by two or three rather large, triangular spines located near their borders. The cephalopharyngeal skeleton (mouth hooks, and so forth) is composed of two long and nearly parallel rods slightly curved outward at the tip on which two crescent-shaped mouth hooks articulate. The hooks

circular elevations above the mouth parts at the tip of the head."

Up to the time of submission of this report, which was six months after removal of the larva, there was no further inflammation nor any recurrence of the glaucoma.

SUMMARY

The first reported case of ophthalmomyiasis interna anterior in the United States is recorded.

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HYPERMETROPIA*

ALFRED COWAN, M.D.
Philadelphia

My reason for discussing this subject is to offer a few observations concerning a condition which, although the most frequently met with in any ophthalmologist's practice, is hardly ever mentioned in modern ophthalmic literature. One might be led to believe that there is nothing more to be said on the subject; but there are some factors concerning the management of hypermetropia about which there is still a difference of opinion, and many important considerations that are too slightly stressed in the textbooks.

Although hypermetropia is found more often than any other refractive error of the human eye, its nature was the last to be comprehended. The occurrence of myopia has been known for centuries, and its theory fairly well understood since the explanation by Kepler in 1604. Regular astigmatism was first discovered by Thomas Young in 1793, and thoroughly described by Airy in 1827. That accommodation depends on a change in the form of the crystalline lens was correctly reasoned by Thomas Young as early as 1801. But the existence of hypermetropia was not even suspected until 1811, when a case was reported by Wells. Donders

very generously attributes the discovery of hypermetropia to James Ware who, before the Royal Society, in 1812, spoke the following remarkable words: "There are also instances of young persons, who have so disproportionate a convexity of the cornea or crystalline, or of both, to the distance of these parts to the retina, that a glass of considerable convexity is required to enable them to see distinctly, not only near objects, but also those that are distant; and it is remarkable, that the same glass will enable many such persons to see both near and distant objects; thus proving that the defect in their sight is occasioned solely by too small a convexity in one of the parts above mentioned, and that it does not influence the power by which their eyes are adapted to see at distances variously remote. In this respect such persons differ from those who had the crystalline humor removed by an operation; since the latter always require a glass to enable them to discern distant objects, different from that which they use to see those that are near." Ware's discovery, however, was not appreciated by his contemporaries, because it was not understood, even by Ware himself.

From time to time after this, isolated cases of high degrees of hypermetropia were reported, but it was thought to be a

* Read before the Washington, D.C., Ophthalmological Society, January 9, 1939.

disease, a form of premature presbyopia. It was called by such terms as hyperpresbyopia or oversightedness. The amblyopic eye in convergent squint was believed to be myopic. Also, those patients with high degrees of hypermetropia who could see by holding objects very close to the eyes were thought to be myopic. Ophthalmologists could not understand how convex lenses could improve the vision of a young person for distant objects. They were prejudiced against them, thinking harm would result and always advised against their use. This confusion lasted until 1858, when the mystery was entirely cleared up by the masterly work of Donders. Not until then was hypermetropia distinguished from presbyopia. At the meeting in Heidelberg, in 1859, he showed that presbyopia and the so-called hyperpresbyopia are entirely different conditions and argued that the term hyperpresbyopia should no longer be used. Helmholtz, who was at the meeting, immediately named it hyperopia, but Donders, on more fully working out his system, thought the term hypermetropia would be more in accordance with the nomenclature he had already employed in the words ametropia and emmetropia.

Optically the hypermetropic eye is weak. It is generally considered—in contradistinction to myopia, which is the result of overdevelopment of the eyeball—that hypermetropia is due to arrested development. Still, most of us feel that the hypermetropic eye is the strong eye, physically; even that the low-grade hypermetropic eye is ideal in the case of a healthy young individual. Gullstrand gave 1 D. of hypermetropia to his exact schematic eye. If it is true that the low-grade hypermetropic eye is ideal, it is hard to understand just how to classify the emmetropic eye because, not infrequently, we do find such eyes. Often we find a lowered visual acuity in very high

degrees of hypermetropia, and almost invariably we see it stated that the poor vision is part of the retarded or abnormal development of the eyeball as a whole. This has always seemed unreasonable to me. Surely, the sensitivity of the retina does not progressively increase with the growth of the eyeball during the growing age. It is reasonable to suppose, and no doubt true, that hypermetropia is the result of retarded growth of the eyeball. Hypermetropia is normal in infants; but the physical cause of the lowered visual acuity in adults with high-grade hypermetropia must certainly be present at birth and, therefore, congenital. Otherwise all children should be expected to have subnormal vision. There are other reasons for believing that eyes with very high grades of hypermetropia and lowered visual acuity are congenitally defective and not the result of retarded growth; at least, not after birth. During the growing period, ordinary degrees of hypermetropia decrease, emmetropia goes over into myopia, and myopia increases; but cases of very high hypermetropia decrease very little, if at all. The highly hypermetropic eye with low visual acuity is generally a congenitally defective eye and should be considered pathologic, as is microphthalmus. Hypermetropia of low degree is as good as emmetropia, but only up to the presbyopic age. The presbyopic emmetropic eye is certainly better than the presbyopic hypermetropic eye. At my age I should prefer to have exactly 2.50 D. of myopia.

A hypermetropic person has to exert some accommodation at all times in order to see any real object distinctly. The essential cause of asthenopia in hypermetropia is fatigue of accommodation together with the secondary effects of the contraction of the pupil and of convergence. Certainly most of the discomfort of which the uncorrected hypermetropic

person complains is due to the excessive accommodation he must constantly use, but the asthenopia that results from the accompanying contraction of the pupils is seldom stressed. In any case of uncorrected ametropia the size of the diffusion images is proportionate to the size of the pupil. Hypermetropic persons of medium and high degree often get their best effect by accommodating as much as possible, not so much to correct the refractive error optically—they may disregard it entirely—but in order to contract the pupil, and by so doing reduce the size of the diffusion image. Weakness of the sphincter of the iris is, therefore, an important factor in the production of asthenopia in hypermetropia. Constant contraction of the pupil can cause actual pain in the eye, especially in the presence of an unhealthy or partially atrophic iris.

I have in mind a group of patients, which I intend to discuss more fully at some later time, composed entirely of women who complain that after 10 or 15 minutes of close work the discomfort is so great that they simply must stop. This in spite of the fact that very careful testing will disclose that the glasses are correct, and the accommodation, convergence, and muscle balance are normal. If these persons are examined with the slit-lamp it will be found that they have an extremely low-grade uveitis—more or less endothelial dystrophy, a few corneal precipitates, sometimes a few cells in the aqueous, pigment absorption, and more or less atrophy of the iris. These women are nearly all in their late thirties or early forties, who give a history of premature or induced menopause or who have had some kind of operation on the uterus or ovaries.

The enlargement of the pupil associated with the relaxation of the accommodation is one of the reasons for the discomfort which hypermetropic persons experience

with their new correcting lenses. They must learn to depend for the distinctness of the retinal image on the correction of the optical error instead of the size of the diffusion images. It should be remembered that the wider pupil with correcting glasses also increases the luminous intensity, so that bright light might be somewhat dazzling at first; but this is compensated for by the added comfort of being able to read with an amount of light that is entirely inadequate without correction. We all know that one of the first complaints of hypermetropic subjects upon approaching the presbyopic age is that they are unable to read with poor light.

Theoretically, the treatment of hypermetropia with correcting glasses is a simple matter, but practically it is often a very serious problem that depends upon the knowledge, experience, and judgment, and sometimes the imagination, of the ophthalmologist.

Often we see patients who have reached 35 or 40 years of age with fairly high degrees of uncorrected hypermetropia, very little of which is manifest, and who have had no material discomfort. On the other hand many young persons undoubtedly suffer from the effects of comparatively low errors. We say that hypermetropia of 1.25 D. is ideal from the standpoint of usefulness. Nevertheless, all of us have relieved the distress of asthenopia in any number of young persons by partial or nearly full correction of such or even smaller errors. There is no satisfactory scientific reason for this. A healthy person with 9 or 10 D. of accommodation should be able easily to overcome 1 D. of hypermetropia, especially for his distance vision. Uncorrected, he will need to use 4 or 5 D. of accommodation for close work. This might be fatiguing, but he will never need more than 2 D. from infinity in to 1 meter, because the whole

range of accommodation from infinity in to 1 meter is less than 1 D. Still we find many young persons with low-grade hypermetropia who are actually uncomfortable unless they wear their glasses constantly for both far and near.

Of course compound hypermetropic astigmatism, however slight, may cause severe symptoms of asthenopia. In the correction of anisometropia, regardless of the type of ametropia, it is extremely important to determine the exact difference between the two eyes and to maintain the same difference between the two correcting lenses. Except in the presence of some pathology, the accommodation is almost exactly the same in the two eyes. Even a difference of .25 D. will interfere with comfortable binocular vision. The young anisometropic subject, one eye undercorrected, will ordinarily obtain distinct vision in only this eye at the same time. If he wishes to obtain clear vision in the other eye the undercorrected one must turn inward because of the added accommodation and associated convergence. In this case the patient is either compelled to fuse two images of unequal distinctness or suffer the consequences of a deviation of the visual lines. It is a serious mistake to prescribe a pair of lenses in which a different reduction or "cut" of the static findings is made for the two eyes. The proper modification of the static findings should be determined in the postcycloplegic examination. The postcycloplegic test is really a method of fogging, and in this, as in any fogging method, both eyes and not one at a time should be tested. Regardless of the type of ametropia, equal subtractions or additions must be placed before the two eyes at the same time. Besides the visual acuity with both eyes open, the muscle balance and accommodation should be determined at the postcycloplegic test and with the full static correction. The amount of modification or

"cut" should depend, not on fixed rules, but on the following factors: Age of patient, whether or not he has worn glasses, vision, occupation, accommodation, muscle balance, symptoms. All of these must be taken into consideration before a decision can be made. Finesse in refraction is possible of attainment only by the close combination of a knowledge of theory with careful clinical observation.

Even such rules as that a full or nearly full correction should be given with associated esophoria, and that a considerable reduction be made with exophoria, need not be strictly observed. Taking all things into consideration, it is often good practice to make a large reduction in esophoria or a nearly full correction in exophoria. We are often reminded that 6 meters is not infinity, it amounts to $1/6$ of a diopter of power, and that at least this amount should be allowed; which is perfectly true. It should, however, be stated also that the wider the pupil the greater the refraction at the periphery, and, when measured under cycloplegia, the increased refraction (because of the wide pupil) more than compensates for the power equivalent to the distance of the test object. The ophthalmologist need never fear that he will overcorrect the error if he prescribes the full cycloplegic findings. However, I never hesitate to cut plenty.

It is the duty of every prescriber of glasses to choose, from the great variety on the market, that lens which more nearly approaches the ideal for each individual case. The power is not the only thing to write in the prescription for glasses. Up to 6 D. a convex lens with a back surface of about -6 D. will answer every practical requirement of a so-called corrected lens for distance vision. For near vision about a -4 D. back surface is good. It is best in these lenses to have the back surfaces of a pair as nearly the same as pos-

sible. Ordinary toric lenses do not have constant back surfaces and, therefore, should not be used in powers above 1 D. Under 1 D. the stock toric lenses are sufficiently correct for practical purposes. The -6 D. back meniscus lenses are good. The upper part of the one-piece or ultex bifocal is ordinarily ground on a constant -6 D. spheric back-surface curve. The surface of the reading portion being necessarily weaker, these lenses nearly approach the ideal shape for both far and near in the ordinary powers. They are the bifocals of choice for weak distance powers of both denominations and for all powers of the convex.

Strong convex lens combinations should always be transposed to conform as nearly as possible to the finished spectacle lens before the subjective refraction is finished. For example, suppose the determination by the ordinary procedure is +5 D. sph. \approx +2 D. cyl. ax. 90°. Transposed, this lens can be written +7 D. sph. \approx -2 D. cyl. ax. 180°. Place the concave cylinder next to the eye in the trial frame and with the concave surface inside. The sphere is placed in front, convex surface in front (it is assumed that the trial lens is plano-convex). Now, since the effective power is different after the transposition, it will be necessary to determine this difference subjectively. If this is done the difference between the finished spectacle lens and the trial-lens combination will be negligible. This method is particularly useful and should always be carried out in cases of aphakia. Aphakics obtain much comfort from properly shaped lenses, and every effort should be made to prescribe the best form.

We should utilize the accessory effects of the correcting glass; for example, the farther away from the hypermetropic eye the weaker the correcting lens need be and the larger the size of the retinal image. This effect is, of course, greater in proportion to the degree of hypermetropia. Strong convex lenses, therefore, should be set as far away from the eye as possible. In this way, by increasing the size of the retinal image we can sometimes increase the visual acuity. In very high degrees of hypermetropia and in aphakia the smallest change will make a noticeable difference. It is well in these cases when the patient returns to have his glasses checked, to try the effect of pulling the finished spectacle glasses away or pushing them a millimeter or two closer to the eyes. If either change of position is an improvement, the optician should be asked to readjust the frames. We can always feel sure that a hypermetropic patient is not overcorrected if he continues to see clearly at a distance when the lenses are pulled away from his face.

Over and over again we see it stated that we should take as the expression of hypermetropia the strongest convex lens which adapts the eye to infinity. This rule should not be observed in patients under cycloplegia. The glass that gives the best visual acuity is the measure of the refraction. The most accurate method for the determination of the refraction of the eye is still the subjective method of Donders, by which the refraction is ascertained by that lens which produces the best visual acuity.

1930 Chestnut Street.

A STUDY OF OCULAR DEFECTS AMONG UNIVERSITY STUDENTS*

E. A. THACKER, M.S., M.D.
Urbana, Illinois

If we had a choice of retaining only one special sense, undoubtedly we should all prefer to have sight. Since we receive about 83 percent of our perceptions through vision, the loss of sight is a very grave handicap.

It has been deemed advisable to determine how many of our students in higher institutions of learning have defective vision; how many have such defects properly corrected in so far as that is possible. Another objective is to ascertain the causes of the abnormal vision.

PROCEDURE

The procedure followed in this investigation included the eye history, symptoms, external examination, and the examination of visual acuity by the Snellen Vision Chart of students upon their entrance to the university. Since this method is admittedly an incomplete test for visual defects, the author recognizes that there are present among the students cases of muscle imbalance and of fusion and other ocular disorders that cannot be determined by this type of examination. All students with defective vision were recalled for a recheck of their visual acuity. These students were asked to fill out the following questionnaire:

The name of the person prescribing for the student was checked in the American Medical Association Directory. Each student's history was checked to determine past illnesses and the correlation of certain diseases with the time glasses were first obtained, in so far as this was possible. The same procedure was followed with the physical examination, recording and correlating any present diseased condition which might have some bearing on defective vision; such as, pathological tonsils, dental caries, and so on.

Students whose vision had become worse since their entrance into the university were checked for present foci of infection and also classified as to colleges, the number of years they had been in attendance at the university, and as to the type of scholastic work they were doing, in order to ascertain what effect excessive or prolonged use of the eyes might have on visual defects. The following information was obtained from the oculist who prescribed for the student:

Diagnosis of the student's ocular defect. Probable etiology.

Other members of the family with the same condition.

Was it possible to correct the vision to normal with glasses?

Name Age Class College
Underline symptoms which caused you to seek advice concerning your eyes: Headache, blurring of vision, squinting, watering, burning of eyes, twitching of lids, others
Name of person from whom you obtained examination for glasses
..... Address
Was he an oculist, optometrist, or general physician? (Underline)
For what reason were you told that you needed glasses?
Date glasses were first obtained
Date eyes were last examined
Were your lenses changed?
How often do you have eyes rechecked?
What symptoms of eyestrain, if any, do you have now?

* From the University of Illinois Health Service.

TABLE 1
MALE STUDENTS WITH DEFECTIVE VISION IN THE UNIVERSITY

	Students Entered Fall—1937			Upperclassmen and Grad. Students			Totals		
	No.	Percent with de- fective vision	Percent of student body	No.	Percent with de- fective vision	Percent of student body	No.	Percent with de- fective vision	Percent of student body
Defective vision, no glasses	130	9.8	3.7	235*	11.8	3.8	365	10.98	3.77
Defective vision, uses glasses	1194			1763			2957		
Total number with defective vision	1324		37.7	1998		32.4	3322		34.3
Total number men students in Uni- versity	3509			6156			9665		

* Estimated from examination of 1096 students with defective vision—130 not wearing glasses.

How often has it been necessary to change lenses?
Date of last examination.

RESULTS

Table 1 reveals that 37.7 percent of the entering students in the fall of 1937 had defective vision and that 32.4 percent of the upperclassmen did not have normal vision. Approximately 365, or 10.98 percent, of the students with defective vision were not wearing glasses—3.77 percent of the total male student body. Since the students with normal vision upon entrance to the university were not rechecked, these data probably give no information regarding many who

may have developed defective vision since entering school, and who have not reported to the Health Service. Nevertheless, the evidence obtained from this investigation reveals that 34.3 percent of the male student body have defective vision.

Out of the 1,838 students wearing glasses at the time of their physical examination upon entrance to the university, 526 or 28.5 percent had errors of refraction not corrected to normal by glasses (table 2). These results also revealed that 21.8 percent of the upperclassmen wearing glasses, who were checked at the Health Service, obtained their glasses after entrance to the uni-

TABLE 2
THE CORRECTION OF REFRACTIVE ERRORS BY USE OF GLASSES

	No. of Students	Percent	Total Examined
Entered with vision not corrected to normal with glasses (from records)	526	28.5	1838
Glasses obtained just before or at entrance to University (from questionnaire)	497	31.9	1556
Glasses obtained since entrance exam. Based only on upperclassmen and grad. students who are wearing glasses (from records and questionnaires)	211	21.8	966
Lenses changed at last examination by ophthalmologist or optometrist (questionnaire)	622	56.8	1095
Total with incorrect vision now wearing glasses (records and recheck at Health Service)	696	30.2	2302

TABLE 3

UPPERCLASSMEN WHOSE VISION WAS WORSE SINCE ENTRANCE INTO UNIVERSITY
CLASSIFIED AS TO COLLEGE

College	Students Wearing Glasses			Students Wearing No Glasses			Summary		
	No. Re-checked	No. Vis. Worse	Percent Worse	No. Re-checked	No. Vis. Worse	Percent Worse	No. Re-checked	No. Vis. Worse	Percent Worse
Agr.	80	18	22.5	16	2	12.5	96	20	20.8
L.A.S.	307	109	35.5	44	15	34.0	351	124	35.3
Eng.	202	74	36.6	26	12	46.1	228	86	37.7
Com.	207	78	37.6	22	13	59.0	229	91	39.7
F.A.A.	42	17	40.4	5	2	40.0	47	19	40.4
P.E.	15	9	60.0	7	2	28.5	22	11	50.0
Grad.	113	56	49.5	10	7	70.0	123	63	51.2
Total	966	366	37.8	130	53	40.7	1096	419	38.2

versity. There were 696 (30.2 percent) of the 2,302 students checked with glasses, whose vision was not corrected to normal with glasses.

It is interesting to note that 38.2 percent of the students having defective vision upon entrance to the university showed an increase in the error of refraction upon reexamination at the Health Service. These have been classified into colleges (table 3). The Graduate School, Physical Education, Fine and Applied Arts, Commerce, and Engineering Schools, respectively, showed the largest

percentage of students with increase in errors of refraction. The Colleges of Agriculture, Education, and Liberal Arts and Sciences had the fewest number of students with an increase in defective vision since entrance.

An attempt to ascertain the cause or causes for the progression of the refractive defect was made. Among 160 cases studied in which there was a marked change in visual acuity since entrance, 25 percent were honor students, 31.2 percent had a straight A average, 36.2 percent had a B average, and 26.2 percent had a C average (table 4). It is interesting to note that these honor students had no demonstrable foci of infection and gave no history of measles or scarlet fever. Only 4 percent and 3.3 percent of the A and B students, respectively, had foci of infection, whereas 38 percent and 30 percent, respectively, of the C and D students had foci of infection. If it is good logic to assume that grades made by a student are in proportion to the amount of studying done, this would indicate that visual defects of at least some of these students are aggravated by an excessive amount of eye work. This may be due to too long study periods, fine detailed and accurate work which one finds in the Fine and Applied Arts School or accountancy problems in the Commerce

TABLE 4

SCHOLASTIC STANDING—UPPERCLASSMEN AND GRADUATE STUDENTS WHOSE VISUAL DEFECT HAS INCREASED SINCE ENTRANCE TO THE UNIVERSITY

	No. of Students	Percent with Grades	Percent with Foci
Honors: Class and College	40	25.0	0.
Grade average "A"	50	31.2	4.0
Grade average "B"	58	36.2	3.3
Grade average "C"	42	26.2	38.0
Grade average "D"	10	6.2	30.0
Total	160		

TABLE 5
FOCI OF INFECTION—RELATIONSHIP TO DEFECTIVE VISION

	Upperclassmen				New Students				Summary							
	No. Exam. with Foci	No. with Vis. Worse	Percent Worse	No. Exam. with Foci	No. with Vis. Worse*	Percent Worse	No. Exam. with Foci	No. with Vis. Worse	Percent with Foci	No. Foci Def. Vis.	Percent Foci Def. Vis.	No. with Def. Vis.	Percent Def. with Foci	No. with Foci Univ.		
Pathological tonsils	97	42	43.3	63	18	28.5	160	60	4.0	160	40.6	160	9.4	394		
Dental caries	145	70	48.2	51	21	41.1	196	91	8.1	196	25.0	196	11.6	783		
Hay fever	48	16	33.3	22	9	40.9	70	25	2.3	70	30.9	70	4.1	226		
Chr. hyper. rhinitis	29	11	38.6	36	12	33.3	65	23	3.0	65	22.2	65	3.8	292		
Deviated septum	42	16	38.0	65	19	29.2	107	35	5.4	107	20.4	107	6.6	522		
Sinusitis	12	9	75.0	13	10	76.9	25	19	1.4	25	17.7	25	1.4	141		
Total	373	164	43.9	250	89	35.6	623	253	24.4	623		1686	37.3	2358		

School, or the prolonged use of the eyes on fine drafting problems that may be assigned in the Engineering School.

The 623 reexamined students who had foci of infection were classified according to the focus (table 5). Hay fever, chronic hypertrophic rhinitis, and deviated septum were included because these are sources of nasal congestion and obstruction and might have some bearing on the ocular disorders. It will be noted that

TABLE 6

VISION IMPROVED SINCE ENTRANCE TO UNIVERSITY IN RELATIONSHIP TO FOCI OF INFECTION

	Number Improved	Percent Improved with Foci
Pathological tonsils	8	7.9
Caries	10	9.9
Hay fever	10	9.9
Chr. hypertrophy	3	2.9
Deviated septum	5	4.9
Sinusitis	3	2.9
High blood pressure		
Albuminuria		
Total improved	101	

40.6 percent of these students' vision became worse after entrance to the university. Sinusitis, dental caries, and pathological tonsils led the list with the highest percentage. Since there was no indication of apical abscesses in the vast majority of the students with dental caries, I do not believe that the dental decay itself, as a focus of infection, is an important point. However, defective vision and dental caries may be closely allied in that they may both be manifestations of some metabolic disorder. From the opposite point of view: Of the 101 students whose vision improved after their entrance to the university (table 6), only 7.9 percent had pathological tonsils as compared with 37.5 percent with pathological tonsils whose vision had become worse. Only 9.9 per-

* Reported by ophthalmologist.

TABLE 7

CHILDHOOD DISEASES AND DISORDERS—RELATIONSHIP OF COMMON DISEASES TO DEFECTIVE VISION

	No. Cases Students Def. Vis. Studied	Glasses 1 to 3 Yrs. after Disease	Percent Def. Vision Assoc. His. Dis.	No. Students in Univ.	No. Students Hist. of Disease	Percent Stud. University with Disease
Measles	1116	224	20		3135	32.4
Scarlet fever	196	54	30.6		621	6.4
Tonsils and adenoids	609	101	16.5		2081	20.4
Influenza	46	14	30.3		496	5.1
Whooping cough	543	20	3.6		1840	19.0
Mumps	409	36	8.8		1957	20.2
				9665		

cent had dental caries as compared to 45.4 percent whose vision has become worse. There is a wide range of difference between the percentage of students in the university with foci and the percentage of

disease to defective vision in this part of the investigation is not so accurate as is desirable. However, the plan followed included ascertaining the age at which the child had the disease, and if glasses were

TABLE 8

UPPERCLASSMEN—VISION WORSE: CLASSIFIED AS TO YEAR IN UNIVERSITY

	Wearing Glasses			Students No Glasses			Summary		
	No. Re- checked	No. Worse	Percent Worse	No. Re- checked	No. Worse	Percent Worse	No. Re- checked	No. Worse	Percent Worse
Graduate students	113	56	49.5	10	7	70.0	123	63	51.2
Class '38, 4th year	241	104	43.1	36	17	47.2	277	121	43.6
Class '39, 3d year	262	96	36.6	30	13	43.3	292	109	37.5
Class '40, 2d year	350	110	31.4	54	16	29.6	404	126	31.1
Total	966	366	37.8	130	53	40.7	1096	419	38.2

those with foci who have defective vision.

The common childhood type of diseases were also studied in an effort to ascertain any relationship to defective vision (table 7). The determination of the relation of

obtained in one to three years, that disease was considered to be the cause of the ocular defect, or at least a factor in aggravating an already existing condition. Since there are many children with heredi-

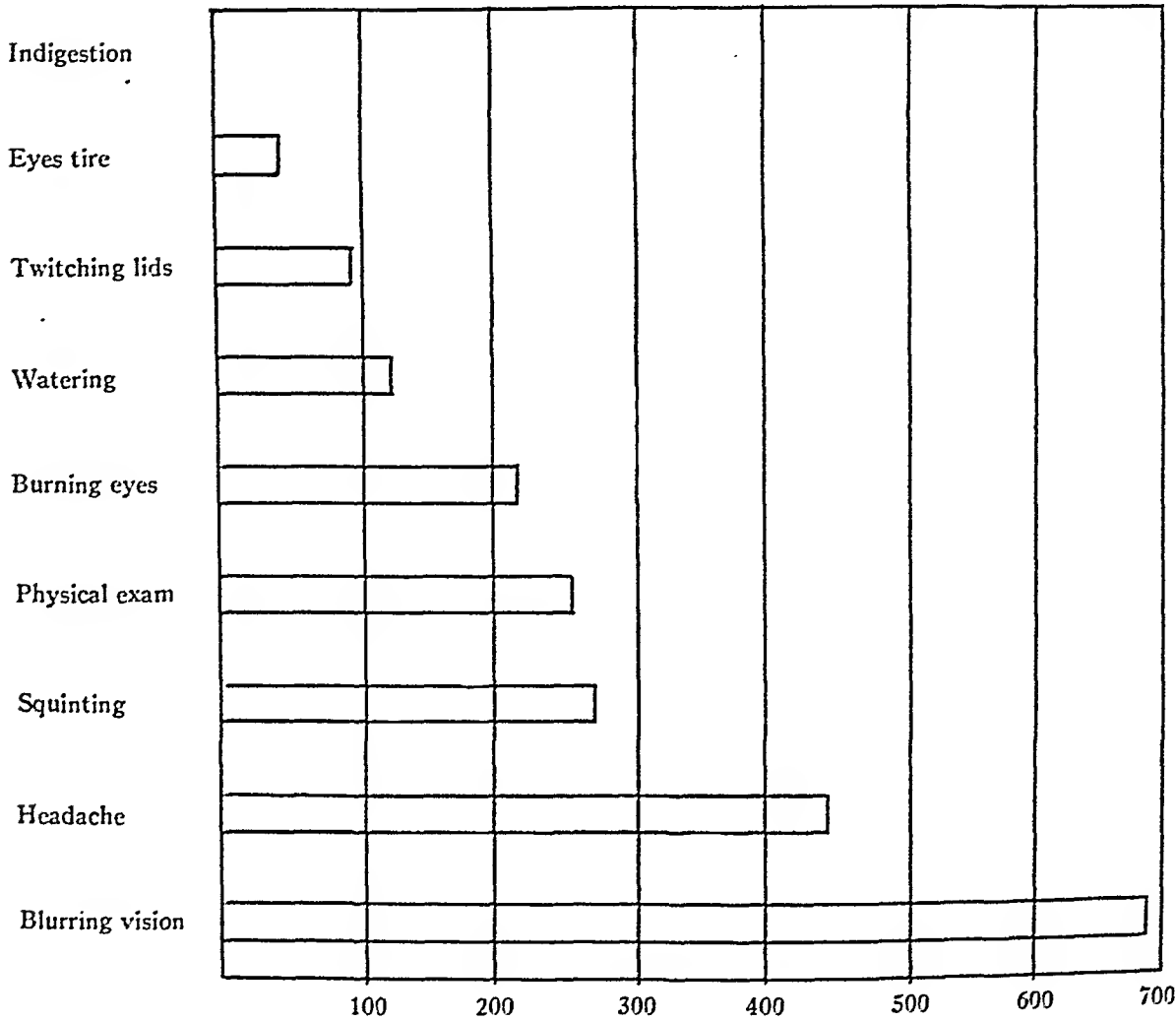
TABLE 9

HOW OFTEN SHOULD EYES BE RE-EXAMINED?
DATA COLLECTED FROM STUDENTS CONSULTING OPHTHALMOLOGISTS

	Lenses Changed	Lenses not Changed	Total	Percent Changed
Over 5 years since examination	6	2	8	75
Examined every 5 years	8	2	10	80
Examined every 4 years	14	3	17	82.3
Examined every 3 years	39	13	52	75
Examined every 2 years	90	35	125	72
Examined every year	84	55	139	60.4
Examined every 6 months	9	9	18	50
	250	119	369	67.7

TABLE 10

SYMPTOMS FOR WHICH 1686 STUDENTS CONSULTED OPHTHALMOLOGIST OR OPTOMETRIST



- 130 Upperclassmen with defective vision, no glasses; rechecked symptoms
- 83 No symptoms, or 63.8 percent
- 9 Headaches
- 14 Slight blurring of vision

tary or congenital ocular disorders which affect vision, and since some of these disorders are not recognized until some time after those children have started to school, one can realize how this method of attacking the problem is open to criticism. In fact, 134 out of 547 reports from the ophthalmologists stated that some other member of the family had the same type

of disorder as the student. Nevertheless, I am presenting it for what it may be worth. Scarlet fever led the group with 30.6 percent with defective vision associated with this disease, influenza 30.3 percent, measles 20 percent. Since the percentage of students in the university with a history of whooping cough and mumps was much greater than that associated

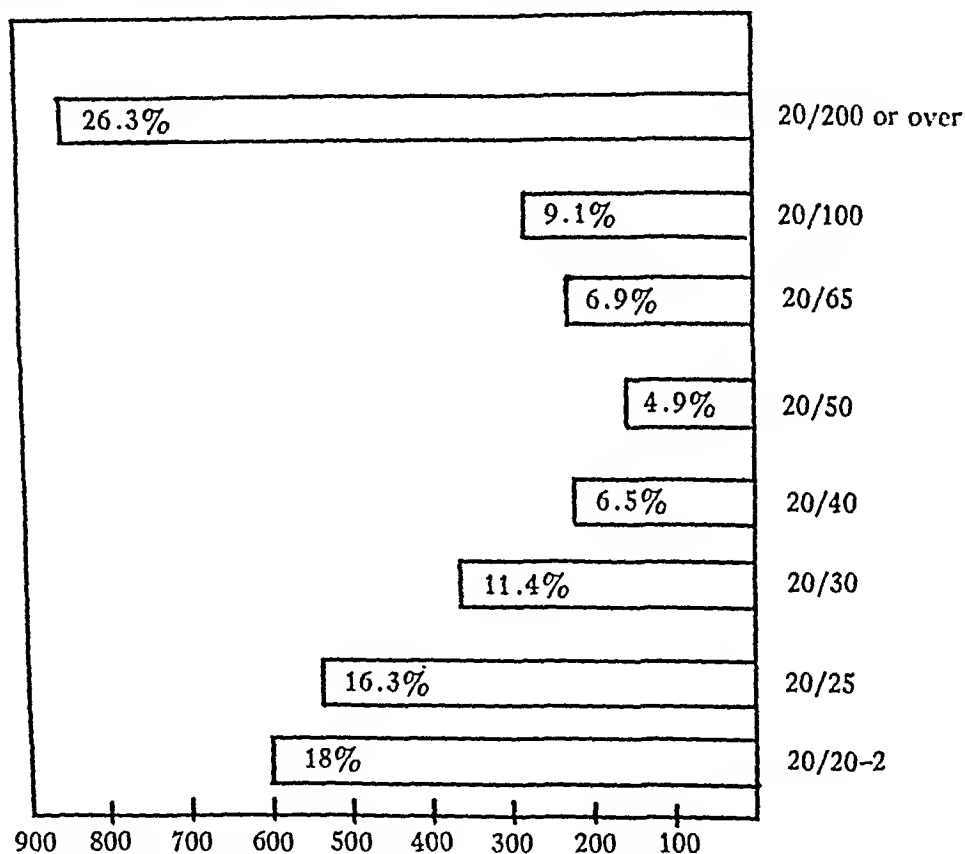
with defective vision, it was considered that no relationship existed between these diseases and defective vision.

Students with an increase in their visual defect were also classified as to the year in school. This gives us a comparative observation of students having abnormal vision (table 8). The visual defects of 21.1 percent of the second-year students became worse. The juniors, sen-

cent of the students examined yearly needed one or both lenses changed; 72 percent of those examined every two years had lenses changed. It is evident from tables 8 and 9 that students should have their vision rechecked regularly and certainly at not longer than one-year intervals. At present only 42.6 percent of the students have their eyes checked yearly or at shorter intervals.

TABLE 11

DISTRIBUTION OF ERROR OF REFRACTION UPON ENTRANCE TO THE UNIVERSITY



iors, and graduate students showed an increase in defective vision of 6 to 7 percent over the younger classes; the graduates topping the list with 51.2 percent of the students' vision becoming worse. Altogether, out of 1,096 students rechecked, 419 or 38.2 percent of these students' vision had become worse since their entrance to the university.

The data obtained from the ophthalmologists (table 9) shows that 60.4 per-

Subjective symptoms of so-called "eye-strain" are not accurate determiners of ocular disorders. Of the 130 upperclassmen with defective vision who were not wearing glasses, 83 had no symptoms, only 9 had occasional headache, and 13 had some blurring of vision (table 10). Fifteen percent of the students now wearing glasses were unaware of any defective vision until they were examined and advised of such a disorder by the Health

Service Staff. In their order of frequency, the most important symptoms that caused the students to consult an ophthalmologist or optometrist are: blurring of vision, headache, squinting, and burning of the eyes.

Classification of the errors of refraction according to the degree of defect was made. Students with marked errors of refraction, reducing vision to 20/200 or less, were far in the majority of the other defects with 26.3 percent (table 11).

An idea of the types of ocular disorders affecting vision may be obtained from the results of the questionnaire sent to the ophthalmologists (table 12). Simple myopia was the most frequent disorder with 27.2 percent. Others in order of frequency of occurrence were hyperopic astigmatism, myopic astigmatism, compound myopic astigmatism, simple hyperopia, and simple astigmatism. One hundred sixty students out of 1,556 rechecked (10.3 percent) had anisometropia.

The cost for the examination and glasses for students varied a great deal. Among the physicians, many of the very low prices were due to the financial status of the patient, or to the student's connection with families of other members of the medical profession. Perhaps the same

TABLE 12
DIAGNOSIS OF DEFECTIVE VISION

	Total Re- ported	No. with Defect	Per- cent
Simple myopia		149	27.2
Hyperopic astigmatism		111	20.2
Myopic astigmatism		89	16.2
Compound myopic astigmatism		60	10.9
Simple hyperopia		40	7.3
Simple astigmatism		33	6.0
Compound hyperopic astigmatism		15	2.7
Mixed astigmatism		13	2.3
Strabismus		10	1.8
Myopic hyperphoria		6	1.0
Amblyopia		6	1.0
Heterphoria		4	.7
Choroiditis		3	.5
Cataract		3	.5
Accom. asthenopia		2	.3
Retinitis pigmentosa		2	.3
Total reports from ophthalmologists	547		
Anisometropia	1556	160	10.3

is true of the reports from the optometrists. The average cost for examination and glasses was \$15.75. It is interesting to note how little difference there is between the charges made by the ophthalmologist and the optometrist (table 13).

SUMMARY

1. Of the male student body at the University of Illinois 34.3 percent have

TABLE 13
PRICES PAID FOR GLASSES AND OCULAR EXAMINATION BY STUDENTS

Visual Defect without Glasses	Oculist			Optometrist		
	No. Students	Av. Price for Exam. and Glasses	Variation Price	No. Students	Av. Price for Exam. and Glasses	Variation Price
20/20	133	\$16.45	\$ 6.50-25.00	137	\$15.08	\$ 5.00-27.00
20/25	89	15.75	7.50-30.00	121	14.17	7.00-34.00
20/30	48	15.77	8.00-27.00	63	15.32	7.50-38.00
20/40	32	16.00	10.00-16.50	38	14.28	8.00-20.00
20/50	30	16.40	10.00-25.00	19	13.42	10.00-17.00
20/65	32	17.57	9.00-30.00	54	15.46	7.00-23.00
20/100	71	17.50	6.00-41.00	59	14.72	8.00-25.00
20/200	139	17.00	7.50-35.00	157	16.00	7.00-45.00
Total	575	16.50		648	15.00	
Average for both Oculist and Optometrist		\$15.75				

defective vision as determined by the Snellen test.

2. Although it is admitted that the correction of muscle disorders may have necessitated some blurring at a distance, nevertheless the glasses of 30.2 percent of the students with defective vision did not correct the distance vision to normal.

3. The visual acuity of 38.2 percent of the students with defective vision became worse since their entrance to the university. Of the sophomores, juniors, seniors, and graduate students, respectively, 31.1, 37.5, 43.6, and 51.2 percent showed an increase in their visual defect.

4. The greatest percentage of students with an increase in visual defect since entrance occurred in the Graduate School, the Physical Education, Fine and Applied Arts, Commerce, and Engineering Colleges, respectively.

5. Evidence is produced showing that excessive use of the eyes is definitely a factor in aggravating an existing visual defect.

6. Foci of infection in many cases cause abnormal vision or aggravate an already existing condition.

7. The relationship of some of the common childhood diseases to ocular disorders is discussed.

8. All students with defective vision should seek consultation concerning their eyes once yearly.

9. Symptoms produced by errors of refraction are discussed. Many times defective vision is present without producing any recognizable subjective symptoms. Fifteen percent of the students with errors of refraction had no symptoms.

10. The errors of refraction are classified according to the degree of defect.

11. The types of ocular disorders affecting vision are tabulated.

12. The cost of examination and glasses averaged \$15.75, although there is quite a large range in costs. There was very little difference between the average charges made by the ophthalmologist and optometrist (not more than 10 percent).

OLIGOSEPTIC TREATMENT OF OCULAR INFECTION

LEO I. HALLAY, M.D.

McClure, Virginia

The term "oligosepsis" was introduced¹ to designate any chemotherapy directed against the virulence of pathogenic microorganisms—primarily bacteria—to reduce their infectious capacity without necessarily destroying them. It was based upon the results of experiments by Mûch² that harmless parasites can be made extremely virulent by treatment with acids, and upon my own experience³ that in actual infection, pathogenic microorganisms can be rendered harmless by restoring the acid-base balance in the infected area. This appeared to be possible: (a) by hydrotherapeutic procedures designed to produce sweating; (b) by anti-ketogenic diet; (c) by application of powdered sodium bicarbonate or of soap lather as buffers in infections of the skin; (d) by application of protein buffers in infections of mucous membranes. My own experience has shown that oligosepsis thus produced is the most harmless and the most proficient means of treating acute infections.

Further development of these ideas has led me to the evaluation of the buffer properties of soap lather in the oligoseptic treatment of ocular infections. The present knowledge of the chemical properties of soap is given in the fourth edition of the "Ullman'sche Enzyklopaedie der technischen Chemie." As this source states, "Due to the fact that the fatty acids are very weak acids which dissolve in water into very foamy solutions, only a slight amount of electrolysis takes place. These solutions belong to the so-called colloidal electrolytes. The cation of the solution is the ion of the alkali metal; the anions are not only the simple fatty acids, but also a compound formation with a high electrical charge and formed by a considerable

amount of undissolved soap molecules. Simple fatty acid anions could be elicited in weaker solutions; however, in $n/2$ solutions only colloidal electrolytes can be found. An increase of the concentration converts even the undissolved soap completely into the colloidal form. This compound formation of ion micelle (McBain) is highly soluble. However, this solubility decreases with the increase of the concentration, which then results in an increase in the conductivity. Contrary to previous statements, very little electrolysis can be elicited in soap solutions, and the OH-ion concentration is formed only in solutions between $n/3,000$ and $n/300$; it is strongest in the salts of the high molecular fatty acids. The concentration of alkali ions in soap solutions is so weak that, according to the most recent investigations, the alkali action of soap when used for washing can be entirely ignored."

This infinitesimal degree of soap-solution ionization seems to explain the buffer action of soap when applied to infected areas of the skin; it also seems to explain the obvious bufferlike action of soap lather in wet media, especially in the eye.

When, in the winter of 1937, I had a traumatic injury of the cornea of the right eye and of the eyeball, associated with subconjunctival bleeding and a very extensive reactive conjunctivitis, I decided to try out both the oligoseptic and anti-phlogistic action of soap lather. As was to be anticipated, the application of soap to the eye caused a considerable increase of the pain due to trauma. However, this eased after several minutes, and I then realized that my right eye, which had been closed since the previous day, had opened spontaneously. There was a marked in-

crease of the injection of the conjunctival capillaries; however, this was not the flaming redness of an inflammation, but rather the livid redness of an irritation. After about half an hour this livid redness disappeared, leaving a bright-red spot at the cornea due to the subconjunctival bleeding. The treatment was repeated the next morning, and it resulted in a complete recovery. Since that time I have had the opportunity of corroborating this experience in numerous industrial accidents, always with the same result.

The next step was to ascertain whether conjunctivitis or keratitis due to infection could be influenced in the same way. Several cases of simple acute conjunctivitis or keratitis have therefore been subjected by me to oligoseptic treatment with soap buffer, resulting, without exception, in complete recovery. A beginning conjunctivitis would clear up in about half an hour, and no pathological symptoms could be observed afterwards. However, in cases in which the infection had persisted for more than a day, the objective symptoms could not be relieved by a single treatment, but a daily application for several days was necessary. The prodromal conjunctivitis of measles seemed to clear up temporarily after soap-lather application; however, no influence on the progress of measles could be observed: the exanthema appeared according to schedule. In January, 1939, there was an epidemic of acute contagious conjunctivitis in McClure, Virginia; 32 cases were observed, and almost all of them were treated by oligosepsis. Beginning cases could be checked by a single treatment; the more advanced cases had to be treated for two to four days. The same progress was observed in several cases of blepharoconjunctivitis, which, as is known, is a very stubborn condition. Even this affection, according to my own observation, responded favorably and was sometimes

cured by systematic treatment with the buffer colloid.

In cases of foreign body in the conjunctiva or cornea, the foreign body was removed under aseptic conditions and treatment with soap lather applied. The reaction of hordeola to oligosepsis depended upon the stage of their development. In the beginning stage they could be checked by a single application; abscessed hordeola had to be punctured and the pus removed before the application of soap lather to check the infection. Recurrences could be prevented by systematic cleansing of the lids and of the conjunctival sac with soap, especially when itching appeared. Two cases of dacryocystitis reacted favorably.

A considerable stubbornness was exhibited in a case of ophthalmia neonatorum which involved a premature, underdeveloped, and considerably undernourished baby girl, born on January 31, 1938, and first seen by me on February 22, 1938. The accoucheur, according to the parents' statement, had neglected to apply the Credé treatment at birth, and a marked ophthalmoblenorrhoea had been present since the third day postpartum. The baby was cyanotic; both conjunctival sacs were filled with pus, which had closed the eyelids. The infant resisted every attempt to open her eyes.

Both eyes were washed out with soap and water and then the soap buffer was applied, which, as might be expected, caused a considerable amount of pain. However, after several minutes, the baby opened her eyes and kept them open for several hours, her face expressing satisfaction. This probably indicated that the subjective symptoms of the conjunctival irritation had been promptly removed by the treatment. Several hours later the secretion of pus began again, and the baby was found next morning with both eyes tightly closed again, the conjunctival

sacs and the canthi containing pus. Oligoseptic treatment was repeated each morning for six weeks, and resulted in complete recovery of the patient with no remaining injury to the eyes.

The results in every case seem to prove that oligosepsis in the form of local appli-

cation of soap-lather buffer to infected eyes is the most harmless and apparently the most proficient way of treating acute infections of the eye. It can be successfully applied in chronic infections, and seems to be helpful even in cases of ophthalmia neonatorum.

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PROPHYLACTIC FOREIGN-PROTEIN THERAPY IN CATARACT EXTRACTION*

C. A. NOE, M.D.

Cedar Rapids, Iowa

Recently Brown,¹ who has investigated the possible mechanism of parenteral foreign-protein therapy by rabbit experimentation, advocated the intravenous use of typhoid-H antigen (Lilly) in cataract extraction as a prophylactic measure against postoperative inflammation. According to this author an appreciable (1:100) blood titer of antibodies should be built up before the anterior chamber of the eye is opened, in order that the treatment may be effective. By injecting the flagellar "H" antigen of 15 million typhoid organisms intravenously Brown obtained blood typhoid antibody titers of 1:100+ within 48 to 50 hours after the injection.

In order to determine the effects of foreign-protein therapy on postoperative ocular inflammations, a group of 150 patients was studied at the University Hospital Eye Clinic at Iowa City before and after operation for senile cataract. It was believed that with a sufficiently large series and a fairly standard operative trauma some conclusions might be drawn.

The foreign-protein substances used were omnadin, made by Winthrop Chemical Company, and typhoid-H antigen, prepared by Lilly and Company. Omnadin is a "sterile solution composed of protein substances obtained from nonpathogenic bacteria (*Sarcina* and *B. mycoides*), various animal fats, and lipoids derived from bile," according to the pamphlet distributed by the Winthrop Chemical Company. Typhoid-H antigen is prepared by Lilly and Company, by adding 0.1 percent to 0.2-percent formalin or 0.5-percent phenol to a broth culture or saline suspension of a motile strain of *B. typhosus*. Supposedly the action of the "H" antigen is not inhibited by phenol or formalin but that of the "O" antigen is blocked by the process of preparation.

Fifty patients received no foreign-protein therapy; 50 received four consecutive daily intramuscular injections of 2 c.c. of omnadin; and the remaining 50 received four intravenous injections of typhoid-H antigen, each made from 15 million organisms. Because patients could not be hospitalized sooner, the first injection was made 24 hours before operation.

* From the Department of Ophthalmology, College of Medicine, State University of Iowa.

TABLE 1
AVERAGE POSTOPERATIVE CILIARY INJECTION

Days P.O.	1	2	3	4	5	6	7	8	9	10	11	12
Typhoid-H anti- gen.....	1.28	1.12	1.14	1.15	1.18	1.18	1.11	1.12	1.06	.98	.87	.79
Omnadin.....	1.31	1.56	1.64	1.82	1.85	1.77	1.72	1.68	1.63	1.51	1.40	1.33
No foreign protein.	1.40	1.53	1.60	1.54	1.57	1.52	1.49	1.34	1.15	1.20	1.18	1.02
Average.....	1.33	1.47	1.46	1.50	1.53	1.49	1.44	1.38	1.28	1.23	1.15	1.05

According to Brown it should have been given at least 24 hours earlier.

Patients in each of the three groups were observed simultaneously so that seasonal influences were eliminated. The average age of each group was approximately the same. Seventy-four percent of the group which received no foreign protein were operated on by the intracapsular method of extraction, as were 70 percent of the omnadin group, and 66 percent of the typhoid-H-antigen group. One must presume that the operative trauma was similar in the three groups. All cases had clinically normal conjunctivae preoperatively, and conjunctival cultures showed no pathogenic organisms. Patients with complications such as previous ocular inflammations, anterior-chamber hemorrhage, and loss of vitreous, were not included in the series.

The eyes were inspected daily for 12 days after operation, and the amount of ciliary injection carefully noted. This was estimated as one to four plus, using colored drawings as a measuring stick. The average daily redness is shown in table 1.

It is noted that the omnadin group showed the greatest reaction, with the control group showing but slightly less. The typhoid group falls definitely below

the average of the other two. In the 150 cases there were 12 which needed further foreign-protein therapy for a secondary iritis on about the ninth day after operation. Of these only two occurred in the group receiving typhoid-H antigen, six in the omnadin group, and four in the control group. It appears then that the post-operative reaction and inflammation were lessened in those who received the typhoid-H antigen. However, in the typhoid group there were two deaths, one from broncho-pneumonia, and one from a cerebral vascular accident. Also two of this group had coronary-artery occlusion causing partial heart block, with eventual recovery. Nine patients in the same group showed such mental confusion that they seriously endangered their eyes by their misbehavior. Such untoward complications were not encountered in the other two groups aside from one patient who had marked mental confusion.

It has been generally recognized that parenteral foreign-protein administration gives rise to the following bodily reactions:

1. Temperature elevation.
2. Leucocytosis.
3. Occasional increase in the serum complement.

TABLE 2
TEMPERATURE FOLLOWING TYPHOID-H-ANTIGEN INJECTIONS

	1st injection	2d	3d	4th
Highest.....	103°F.	103.5°F.	102.8°F.	104°F.
Lowest.....	98°F.	98.5°F.	98°F.	98°F.
Average.....	99.9°F.	100.4°F.	100.4°F.	99.8°F.

TABLE 3
DATA SHOWING SPECIFIC ANTIBODY RESPONSE TO INJECTIONS OF TYPHOID-II ANTIGEN

Age	Injections	Antibody	Before injection	1st day	2d	3d	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th
75	4 every 24 hrs.	O H	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	5 5	10 10	40 40	40 40	80 80	80 80	
62	4 every 24 hrs.	O H	0 0	0 0	0 0	0 0	0 0	20 0	160 0	320 0	640 5	1280 40	1280 160	1280 320	1280 640	1280 640	
80	4 every 24 hrs.	O H	0 0	0 0	0 0	0 0	0 0	0 0	10 0	10 0	20 0	40 10	40 20	40 40	40 40	40 80	40
56	4 every 24 hrs.	O H	0 0	0 0	0 0	0 0	5 0	5 0	10 0	20 0	40 0	40 0	40 0	80 5	80 10	80 40	80
75	4 every 24 hrs.	O H	5 0	5 0	5 0	10 5	10 5	20 5	80 80	1280 80	1280 320	1280 640	2560 640	2560 640	2560 1280	320 320	
70	4 every 24 hrs.	O H	0 0	0 0	0 0	5 5	10 5	10 10	80 40	640 320	1280 640	2560 2560	2560 2560	2560 1280	2560 2560	2560 2560	
61	4 every 48 hrs.	O H	0 0	5 5	5 5	5 5	5 5	10 10	40 40	640 640	2560 2560	2560 2560	2560 2560	2560 2560	2560 2560	2560 2560	
70	4 every 48 hrs.	O H	0 0	0 0	0 0	0 0	0 0	20 0	80 20	2560 640	2560 640	2560 640	2560 1280	640 640	1280 1280	1280 1280	
47	4 every 48 hrs.	O H	0 0	0 0	0 0	0 0	20 0	160 80	2560 80	2560 320	2560 2560	2560 2560					
73	4 every 48 hrs.	O H	0 0	0 0	0 0	0 0	0 0	5 5	10 10	40 20	160 80	320 80	640 640	640 640	640 1280	640 1280	320 1280
69	4 every 48 hrs.	O H	0 0	0 0	0 0	0 0	0 0	0 0	5 0	5 0	10 5	20 10	20 20	20 20	20 20	20 20	40 20
59	4 every 24 hrs.	O H	0 0	0 0	0 0	0 0	5 5	20 20	80 160	320 320	1280 1280	640 640	640 640	1280 640	1280 640	1280 640	
68	4 every 24 hrs.	O H	0 0	0 0	0 0	0 0	0 0	0 0	20 0	40 0	160 10	320 320	640 320	1280 640	1280 640	1280 640	
67	4 every 24 hrs.	O H	10 10	10 10	10 10	10 10	10 10	40 40	160 80	2560 2560	2560 2560						

The numbers represent the times dilution of the patient's serum in which macroscopic agglutination was seen.

4. Increased, followed by decreased, capillary permeability.
5. Specific and nonspecific antibody formation.

Only the first and last of these reactions were studied in the patients observed. Temperature records were kept on all cases. The omnadin and control groups showed no rise in temperature. In the typhoid-H-antigen group a definite temperature response was observed, the peak coming usually from four to eight hours after the injection. Rarely was this fever accompanied by a chill. Table 2 shows the highest, lowest, and average oral temperature after each injection.

The specific antibody response in the blood was studied in 14 of the group receiving typhoid-H antigen. Control venous-blood specimens were drawn before the injections were begun, and then daily specimens at about 9 a.m. After clotting, the blood was centrifuged, and the serum was withdrawn not more than three hours later. The standard dilution and incubation technique employed by the Iowa State Hygienic Laboratory was followed, using the 900 million organisms per cubic centimeter of antigen, both "O" and "H," prepared by this laboratory. As can be seen from table 3, no appreciable titer was obtained until about the fifth day after the beginning of the injections, and the maximum usually not before the ninth day. The "O" agglutinins usually rose somewhat more rapidly than the "H." There was no history of typhoid fever or immunization against this disease in any of the cases. Five received typhoid-H-antigen injections every 48 hours to avoid a

possible negative-phase reaction, but no difference in the rise in titer was observed. There was no definite observable relation between the antibody titer and the redness of the eye.

Table 3 gives the age of the patients, the interval between the injections of "H" antigen, and the "O" and "H" agglutinin titer of the patient's serum before and after these injections.

According to Brown's² theory the beneficial effects of parenteral foreign-protein therapy in nonspecific uveitis occur because of the production of blood antibodies which, on opening the anterior chamber, appear in the aqueous and interfere with the reaction of the exciting antigen and the waiting antibodies in the sensitized eye. If this is correct, it would seem likely that if the inflammation after cataract extraction is lessened by foreign-protein therapy it is similar in nature to nonspecific uveitis.

CONCLUSIONS

1. Prophylactic intravenous administration of typhoid-H antigen (Lilly) apparently lessens the inflammatory reaction after cataract extraction, and gives rise to both "O" and "H" antibodies in the blood.
2. There seems to be no definite relationship between blood-antibody titer and postoperative reaction.
3. Omnadin (Winthrop) produced no change in postoperative reaction from the control series.
4. Typhoid-H antigen (Lilly) must be used with great caution in old people with pathologic vascular systems.

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NOTES, CASES, INSTRUMENTS

MOSQUITO LID-CLAMP RETRACTORS*

RAMON CASTROVIEJO, M.D.
New York

In operations upon patients with corneal opacities due to trauma, especially those from chemical burns, many cases are found in which a speculum cannot be used on account of pronounced symblepharon. In such instances, the author had been using, instead of a speculum, sutures inserted into the eyelids near their margins. Generally one suture, inserted in the center of each lid, was sufficient. This type of suture had also been used by the author for cataract extraction in order to avoid pressure upon the globe. Sutures present certain disadvantages: (1) they are painful to insert and (2) occasionally they produce hematomas which, although very seldom severe, may increase the risk of infection as well as give the patient a temporary disfigurement. If the traction exerted upon the suture is greater than the resistance of the skin and subcutaneous tissues into which they are inserted, the sutures may tear loose, sometimes at a most inopportune moment in the surgical procedure.

For certain operative procedures the speculum, either when actuated by a spring or set with thumb screws, limits the free use of surgical instruments.

To avoid the disadvantages of the sutures or speculum, the author has been using with satisfactory results small retractors clamped to the lids, designed to give the maximum possible exposure of the palpebral aperture with minimum interference in the operative field. On account of their small size, these instru-

ments have been named Mosquito Lid-Clamp Retractors. These retractors are essentially a pair of small metal clamps in the shape of a letter U. Their length is about 5 mm., and their width 3 mm., with a space between the two arms just sufficient to permit the eyelid to be inserted.

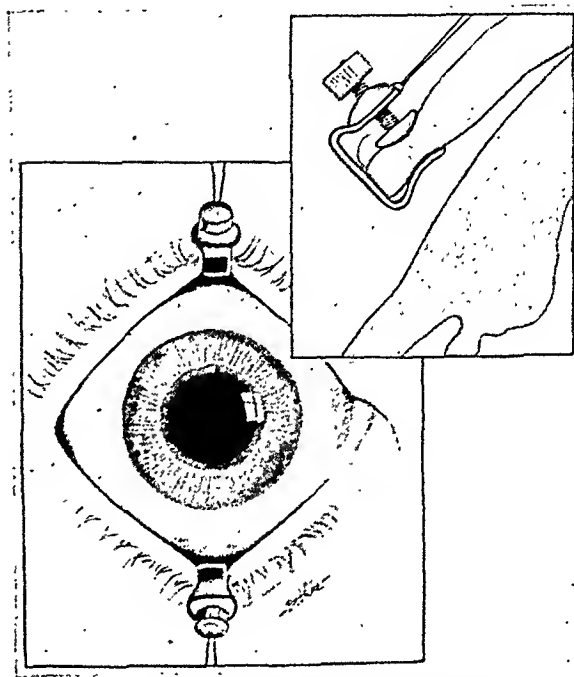


Fig. 1 (Castroviejo). Mosquito lid-clamp retractors. Front and profile views.

A slight extra bend at the base gives additional space for the lid margin (fig. 1).

One of the arms carries a small clamping screw with a knurled head. A few turns serve to clamp the lid firmly in place between one arm of the U and a rounded plate fixed to the end of the screw. When withdrawn, this plate fits into a recess in the arm, so as to offer no obstacle to easy insertion or removal of the lid margin. When the clamp is fixed in position, a thread passing through an eyelet in the flange serves to exert traction, thus retracting the lid. The thread is securely fastened to the towels surrounding the

* From the Institute of Ophthalmology of the Columbia Presbyterian Medical Center.

operative field by means of hemostatic forceps. The direction of pull is arranged so as to relieve the globe of any pressure due to the lids, either centrally or at the canthi. The retractors are chromium plated, and can be easily sterilized.

For operations that do not require opening of the globe, two retractors, one

tures, since they serve the same purpose, are more reliable, and do not traumatize the tissues. (3) They prevent lid pressure upon the eyeball, which is difficult to avoid with other types of speculum, especially at the outer canthus, without resorting to external canthotomy.

I wish to express my appreciation to Mr. Larkin and V. Mueller & Co. for their coöperation in making the instrument herein described.

635 West One Hundred Sixty-Fifth Street.

CHRONIC ORBITAL OSTEOMYELITIS CAUSED BY TYPHOID BACILLUS*

EUGENE M. BLAKE, M.D., AND
DAVID MASON, M.D.
New Haven, Connecticut

Although most cases of osteomyelitis are caused by the *Staphylococcus* or *Streptococcus*, other pus-forming organisms are sometimes responsible for bone lesions. According to Winslow,¹ 0.85 percent of all cases of typhoid fever give rise to metastatic bone involvement, 0.45 percent of all cases of osteomyelitis being a complication of typhoid fever. In a review of 18,840 cases of typhoid fever and 700 cases of osteomyelitis, Keith and Keith² found approximately the same incidence, 0.87 percent and 0.43 percent, respectively. The evidence of bone infection may first appear years after the attack of typhoid.

As long ago as 1835 Maissoneuve³ recognized osteomyelitis as a complication of typhoid fever, and in 1889 Ebermaier⁴ isolated the typhoid bacillus from a bone lesion, thereby definitely establishing the dependence of the osseous focus upon the initial disease. Almost every bone of the

*From the Department of Surgery, Section of Ophthalmology, School of Medicine, Yale University.

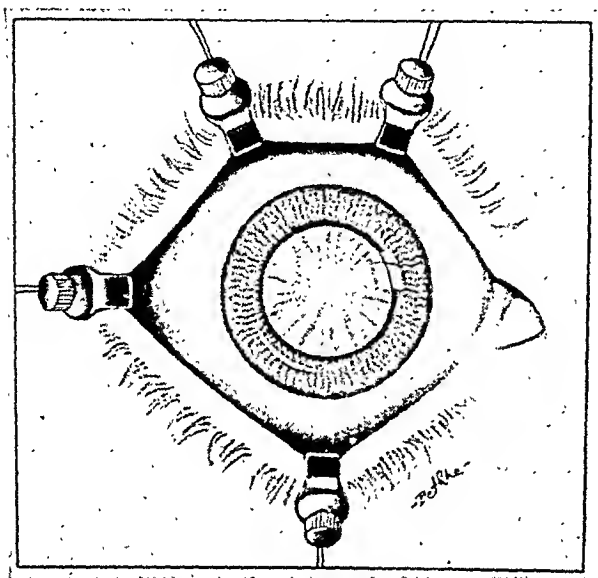


Fig. 2 (Castroviejo). Mosquito lid-clamp retractors. Method of use for intraocular operations.

for each eyelid, are generally sufficient (fig. 2). For operations in which the eyeball is to be entered, with the subsequent danger of prolapse of intraocular structures (such as in cataract operation, corneal transplantation, staphylectomies), the use of four retractors produces a maximum opening of the palpebral fissure without lid pressure upon the globe. The retractor placed at the outer canthus is particularly useful, since it usually eliminates the necessity for performing an external canthotomy.

The main advantages found by the author in the use of these mosquito lid-clamp retractors over other means of opening the palpebral fissure, are: (1) They may be used in cases of symblepharon, when a speculum cannot be inserted. (2) They are superior to the su-

skeleton has been affected by the typhoid bacillus, the most frequent sites being the ribs, the tibia, and the spine, possibly because of exposure to trauma. According to Hertzler⁵ the typhoid bacillus has a predilection for sites not commonly attacked by the *Staphylococcus*, notably the spine and ribs. Reddening of the skin over the site of the bone lesion is more frequent than in other types of osteomyelitis.

Typhoid osteomyelitis of the orbital region occurs with such rarity that one may easily overlook the possibility of this association with a previous typhoid infection. Klemm⁶ reported two cases of osteomyelitis of the floor of the orbit following typhoid, from which the colon and *Bacillus typhosus* were cultivated. Cooperman and Leventhal⁷ described two cases of involvement of the zygoma, and Gore⁸ reported three cases of typhoid periostitis of the frontal bone.

The bone lesion is generally surrounded by practically normal bone with little evidence of reactive proliferation, and there is little tendency to spreading unless secondary infection occurs. The disease cavity is small and usually lined with granulation tissue, with free reddish fluid in the center. Typhoid bacilli from bone lesions have been found viable as long as 13 years after recovery from the disease.⁹

The following case is related because, like the seven mentioned above, it is typical of typhoid osteomyelitis. It presented no febrile periods, was chronic in course, and there was a history of previous typhoid infection. Here, also, the typhoid bacillus was found in the bone lesion several years after the patient's recovery from the general infection.

Case Report. H. J., aged 21 years, a white male, entered the New Haven Hospital on October 29, 1938, because of a marked swelling of the tissues below the outer angle of the right eye and a discharging sinus. The latter had been pres-

ent for two years. The patient had had typhoid fever in 1929, and was confined to bed for seven weeks. Except for this the past history was irrelevant. In March, 1938, a surgeon in an adjacent city had incised the swollen tissues of the right infraorbital region to drain the infected area, but swelling had recurred about every two months. In all, there had been eight exacerbations of the swelling.

The *physical examination* was negative except for a markedly swollen area over the outer portion of the right infraorbital region. There was a small fistulous opening in this area which was draining a thick yellowish pus. The bony ridge of the orbital margin was indurated, and an exostotic elevation was palpable. The white blood cell count was 9,000, 61 percent polymorphonuclears. The cultured urine grew a *Streptococcus viridans*, *Staphylococcus albus*, and unidentified gram-negative rods. The latter did not agglutinate typhoid bacilli. The blood Widal test was positive in 1:40 dilution, showing a mild infection with typhoid. Stool cultures showed no white colonies on endomedium. The blood Wassermann test was negative. An X-ray study of the orbit gave negative findings, although there was evidence of infection of the right maxillary antrum and ethmoid cells, but no clinical signs of involvement of these cavities had been found on examination.

A culture from the fistula taken on the day of admission showed *B. typhosus* and *Staphylococcus aureus*. There was agglutination for typhoid in dilution of 1:1280. A previous culture, taken on October 19th, showed some agglutination in 1:1280, and the following fermentation and morphological appearance typical of the typhoid bacillus:

Lactose — Xylose +2 Motility +
Dextrose — Levulose +3 Indole —

Maltose + Arabinose — Lead acetate +
Mannite + Ruffinose — Russell base +

Hot boric-acid compresses were applied, and on the third day after admission a longitudinal incision was made through the soft tissues down to the bone. There was elevation of the periosteum and thickening of the bone. The sinus tissue was excised, and the diseased bone curetted out. The wound was closed by silk sutures, and a small drain left in place. Cultures taken at this time showed *Staphylococcus aureus* and nonhemolytic streptococcus.

The *pathological report* of the tissue removed was as follows: Masses of dense fibrous tissue contain numerous small blood vessels and are moderately infiltrated with lymphocytes and neutrophils. The major portion of the tissue was composed of unrecognizable necrotic, pinkish-staining material.

Persistent bone fistula with a history of previous typhoid fever should suggest the possibility of a typhoid osteomyelitis. Where free drainage exists, the original typhoid infection should be crowded out by the common pyogenic cocci.^{10, 11} The bacilli occur frequently in the bone mar-

row¹² and have been demonstrated there months after recovery.¹³ Bone infection is only an incident in typhoid bacteremia, so that the patient with osteomyelitis is not considered a carrier. When a bone lesion develops, the sinus must be totally excised or continuous symptoms will persist.^{14, 15} Good results have been reported from the use of vaccine therapy as an adjunct to surgery. Following the World War, Webb¹² reported that in 821 cases in which typhoid vaccination had been given, 12 percent developed bone lesions; whereas, of 297 patients not inoculated, 31 percent had bone lesions.

As points of differential diagnosis it is to be noted that osteomyelitis due to the *Staphylococcus* causes an acute bone destruction that is apt to be extensive. The typhoid bacillus induces a chronic and less destructive lesion. Syphilitic periostitis can be easily recognized in the roentgenogram and is accompanied by positive blood serum. Tuberculosis causes a widespread, destructive, chronic lesion.¹⁶

The authors wish to express their appreciation to Dr. T. L. Hale and Miss F. R. Fox of the Department of Surgical Bacteriology of New Haven Hospital for their valuable coöperation.

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CONGENITAL FISTULA OF THE
LACRIMAL SACJOSEPH LAVAL, M.D.
New York

In the American Journal of Ophthalmology for September, 1929 (volume 12, number 9, pages 745—Levine), there appears my report of a case of this type in which the operative result was unsatisfactory. Since then I have seen no case of this type until May, 1938, nor have I read of any reports on this condition in the American ophthalmic literature of more recent date than 1921.

This condition must be comparatively rare, judging by the paucity of reports and also by the fact that in 12 years of private practice and ophthalmic service at Mt. Sinai Hospital and Manhattan Eye, Ear, and Throat Hospital I personally have seen only two cases. This, however, does not mean that none was seen by any of the other attending ophthalmologists. The published reports are very vague about the operative procedure, as was mentioned in my article in 1929, and for that reason I wish now to report the procedure that was used with a successful result. Unfortunately, I have been unable to follow up my first patient to carry out any further operative procedure.

My second case was seen at Dr. Fletcher's clinic at the Manhattan Eye, Ear, and Throat Hospital. M. C., a girl four years of age, had had tearing since birth from a small opening in the skin on the right side of the nose near the eye, according to the mother's statement. There was no history of infection or injury, no treatment was ever instituted, and this was the first time that advice had been sought.

On examination a small fistulous opening was seen in the skin in the region of the right lacrimal sac and clear lacrimal fluid rolled thence down the side of the

nose and cheek. The lacrimal puncta on both sides were normal in size and position. There was no epiphora on the left side, and the tearing on the right side was only from the fistulous opening and not from the conjunctival sac. There was no evidence of inflammation nor was there any tenderness on palpation.

Operation was performed under general anesthesia without the use of avertin because of the age of the patient. A lacrimal probe was inserted through the fistulous opening along the tract into the lacrimal sac until it met firm resistance. Another probe was passed through the inferior canaliculus into the lacrimal sac and naso-lacrimal canal without difficulty. The latter probe was then removed. An incision was made in the skin on the side of the nose immediately over the probe which lay in the fistulous tract. The incision went through skin and subcutaneous tissue and stopped short of exposing the probe. The skin and subcutaneous tissues were undermined for a short distance enlarging the field of exposure. Dissection with a blunt scissors was then carried out from all sides around the tract with the probe in it. The incision in the region of the fistulous opening in the skin was completed with scissors so as to encircle the hole entirely with a tiny border of skin. Leaving the probe *in situ* but pulling upward on it, the entire length of the fistulous tract was easily exposed to view. With blunt scissors, starting at the fistulous opening in the skin, the tract was completely freed on its under surface up to the lacrimal sac. Here it was cut off from its connection to the sac and removed together with the probe which it ensheathed. The operative area was swabbed with tincture of iodine and then with alcohol. Interrupted silk sutures were used to approximate the skin edges and a pressure dressing was applied.

Healing was entirely uneventful and

there was no reaction. The sutures were removed on the fifth postoperative day and no epiphora was present. Today after six months there has been no recurrence of the fistulous tract and there has been no epiphora figure 1.



Fig. 1 (Laval). Site of operation.

COMMENT

Boyd, in his case presentation in 1915, advised the use of the actual cautery, as did Weidler in 1918. The latter, however, admitted it was only partially successful in his own case but did quote Tyson as finding it satisfactory in one of his patients. The other method advocated by Weidler was to dissect the margin of the fistulous opening with scissors and then to bring the edges together with a purse-string suture. This, we can be sure from a study of the histology of the tract, would be quite useless. Harman in 1903 did not even mention an operative procedure. Nor did Löhlein in 1908 operate, but performed a biopsy of some of the tract to study its pathology. Erggelet in 1929 presented two cases but did not operate. Cosmettatos in 1906 discussed the condition and in 1933 successfully extirpated the tract and studied it micro-

scopically. He found, in agreement with Löhlein, that the epithelium of the skin is continuous with the epithelial lining of the tract at its external opening but becomes less stratified as it continues farther towards the lacrimal sac, where it tends to have more columnar cells. He found no evidence of inflammation. The underlying tissue consisted of connective-tissue fibers with occasional blood vessels. I found substantially the same in my case, as is shown in figure 2, and the lumen of the tract is seen to be entirely patent. No evidence of inflammation is seen and the stratified squamous epithelium has basal columnar cells. The destruction of all

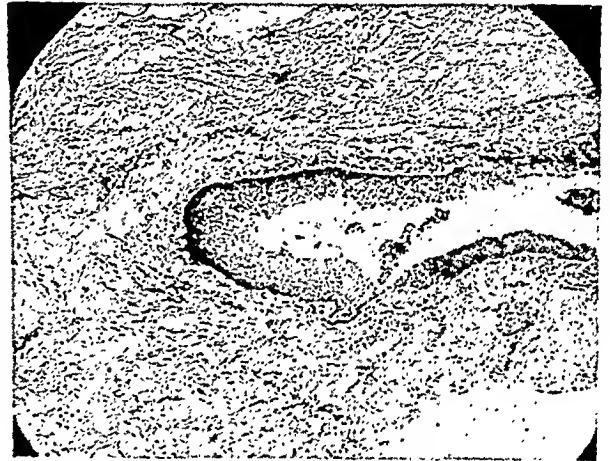


Fig. 2 (Laval). Photomicrograph of fistulous tract.

these cells in the entire length of the tract by chemicals such as trichloroacetic acid or by the actual cautery does not seem feasible. Accordingly, the best procedure is to remove the entire fistulous tract *in toto* surgically, and this is easily done in the manner outlined.

136 East Sixty-Fourth Street.

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SOCIETY PROCEEDINGS

Edited by DR. H. ROMMEL HILDRETH

NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

November 7, 1938

DR. PERCY FRIDENBERG, *president*

SYMPOSIUM ON OPHTHALMIC ENDOCRINOLOGY

DR. D. ROLETT gave an instructional hour on the biomicroscopy of the eye.

DR. ROBERT FRANK spoke on endocrinology of today. In ophthalmology one must frequently resort to endocrinological investigation. The speaker then gave the physiological functions of the individual glands and their interrelationship. He described various gland dysfunctions, covering the pituitary, thyroid, adrenals, pancreas, and gonads. He mentioned congenital cataract under thyroid disease. Very few glandular extracts are of proved value therapeutically except thyroid, adrenalin, pituitrin, and insulin.

DR. WALTER TIMME touched upon pituitary disturbance, stating that oral feeding with this gland is ineffectual.

DR. PERCY FRIDENBERG discussed the ocular symptoms in endocrine disturbances. Pituitary and thyroid disturbance and their relation to ocular symptoms have been well studied, and are described as classical pictures. Parathyroid insufficiency with lens changes can be detected early with the slitlamp and treated with irradiated ergosterol. Diabetic cataract may be pancreatic in origin. Marfan's disease is of interest with its skeletal pathology and lens dislocation. In the Lawrence-Moon-Biedl syndrome we find retinitis pigmentosa. Other disturbances of interest are Hand-Christian-Schüller disease, nevus flammeus with glaucoma,

corneal dystrophies, keratoconus, and so forth.

DR. DAVID MARINE spoke on his study of exophthalmos. The latter may be seen in other conditions; such as leukemia and acromegaly. Proptosis can be induced in animal experimentation.

DR. RALPH LLOYD gave his experience with arachnodactylism.

DR. ISIDORE GIVNER said exophthalmos has been reported following oral administration of thyroid.

Louis A. Feldman,
Transaction Editor.

NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

November 15, 1938

DR. EDWIN B. GOODALL, *presiding*

OBSTETRIC OPHTHALMOLOGY

DR. DEWEY KATZ read an interesting paper on this subject which was discussed in the light of present knowledge under the headings of: changes in the visual field, ophthalmologic aspects of the toxemias of pregnancy, retinal detachment in pregnancy, ophthalmologic indications for the termination of pregnancy and sterilization, birth injuries, ocular disease in the puerperium and lactation period, and ocular disease of the fetus and the newborn.

Dr. Katz's paper is to be published in detail in a book, "Obstetrics," which is being edited by Dr. Fred Adair, Chairman of the Department of Obstetrics and Gynecology of the University of Chicago.

Discussion. Dr. William P. Beetham said that undoubtedly the most interesting phase of "obstetrical ophthalmology" is

the ocular changes that occur in eclampsia. In 4,410 patients delivered through the Boston Lying-In Hospital in 1935, there was a toxemia incidence of 342, or 7.7 percent of all deliveries; in 4,047 patients in 1936, a toxemia incidence of 388, or 9.5 percent; in 4,017 patients in 1937, a toxemia incidence of 327, or 8.1 percent. Roughly, therefore, a toxemia rate of 8 percent of all pregnancies or 80 per 1,000 pregnancies. In the toxemia group: in 1935, eight cases of eclampsia (out of 342 toxemias); in 1936, four cases of eclampsia (out of 388 toxemias); in 1937, 10 cases of eclampsia (out of 327 toxemias); 22 cases of eclampsia in three years, or an incidence rate of 2 percent of all toxemias, or two per 1,000 pregnancies. It is interesting to find that of the 22 cases, 12 developed in patients given some prenatal care and all lived, while 10 developed in patients who had had no prenatal care and seven died. It is, therefore, obvious that for proper statistical consideration, only patients registered for care, and followed in the prenatal clinics, should be studied. From April 21, 1935, to January 1, 1937, the preëclamptic registered patients, to the number of 500, have recently been studied by Dr. F. C. Irving, Professor of Obstetrics, Harvard Medical School. Eighty percent of these 500 were classified as a mild type of preëclampsia; that is, hypertension of moderate degree with no more than a slight trace of albumin in the urine. Twenty percent were of the severe type, having marked, or increasing hypertension and albuminuria. (Hypertension in 16 cases included, 3 nephritis included, 252 primipara, 248 multipara.) It so happened that Dr. Beetham made fundus studies on 197 of these 500 cases. Group 1: 124 cases, 67 percent of the total group observed. Sixty-four percent of this group showed no fundus changes; 34 percent showed increased light reflexes

on vessels, and gave the impression of generalized contraction of the arterial tree; 2 percent showed vessel changes severe enough to give arteriovenous compression. Thus, 36 percent of this group showed vessel changes. Group 2: 73 cases, 33 percent of group observed. Twenty-five percent of this group showed no fundus changes; 56 percent showed increased light reflexes on vessels, and gave the impression of generalized contraction of the arterial tree; 19 percent showed arteriovenous compression. Thus 75 percent of this group showed vessel changes. Much laboratory work has been done on these patients, pathological results being obtained in only 14 percent. The most consistent finding in this entire group, aside from the hypertension, albuminuria, and edema, is the changes in the retinal vessels which occurred in 51 percent of the group as a whole. This indicates the close relationship between preëclampsia and the vascular system. The kidney lesion in eclampsia is considered primarily an arteriolar spasm of the afferent vessels of the tubules. Not one of the cases in this group of 500 showed retinal hemorrhages, edema, exudates, or separations. In other words, the changes one associates with "retinitis of pregnancy" are very uncommon, and one must say that they occur chiefly in the poorly cared for, or neglected cases of pregnancy with toxemia. During the past five years, in answer to most of the consultation requests at the Boston Lying-In Hospital, possibly 8 or 10 retinal separations have been seen (six per hospital record file), and incidentally these are always bilateral; possibly another 15 or 20 cases with occasional hemorrhages or exudates were observed. It was Dr. Beetham's personal opinion that the presence of hemorrhage, exudate, or retinal separation is sufficient evidence to advise interruption of pregnancy.

Dr. Beetham said that Dr. Irving's sta-

tistics indicate that the infant mortality is better if the pregnancy is interrupted during the eighth month, rather than continued through the ninth. Immediate maternal mortality need not be great in carefully treated cases: one case in the group of 500. It is much greater in the neglected cases. Dr. Beetham believed that fully one half of the patients having retinal separation died of eclampsia during hospitalization. If patients with retinitis of pregnancy survive the immediate disease, their prognosis as regards life is reasonable, some 50 percent being alive 10 years later, according to Nettleship.

THE USE OF MECHOLYL AND PROSTIGMINE IN GLAUCOMA

DR. SAMUEL T. CLARKE, Interne at the Massachusetts Eye and Ear Infirmary, read a very interesting paper on the above subject. Dr. Clarke came to the conclusion that mecholyl and prostigmine will prove to be of value in the treatment of glaucoma particularly in the acute and sub-acute types. This paper was published in this Journal (March, 1939).

Discussion. Dr. Paul A. Chandler said that among the many unsolved problems in ophthalmology, glaucoma had its share. In cases of acute congestive glaucoma, if the tension can be reduced with miotics before operation, almost invariably the iridectomy permanently lowers the tension. If however, the tension is not lowered with drops, and we are forced to operate with the pressure high, in many cases the tension does not remain at the normal level, and further surgery is necessary. This is probably due to the formation of anterior peripheral synechiae and a permanent block in the angle of the anterior chamber. With the use of these new drugs the majority of cases of acute glaucoma can be brought to a state of normal tension before operation, so iridectomy may be expected permanently to

relieve a much higher percentage of cases. Dr. Chandler did not think this medication should be considered as a substitute for operation. Once a patient has an attack of acute congestive glaucoma, almost invariably further attacks follow, and he believes an iridectomy is indicated in practically every case. With these new drugs the percentage of operative success will undoubtedly be considerably higher, and the lowered tension preoperatively will certainly minimize the operative risk. Although, as yet, not much is known about the effect of these drugs in chronic glaucoma, they promise to be a valuable adjunct in treatment. There are many borderline cases which are not quite controlled with the miotics thus far available, yet for one reason or another we are disinclined to operate.

Dr. Edwin B. Dunphy said that in 1905, T. R. Eliot observed that after section of a sympathetic nerve going to a smooth muscle, this same muscle would contract perfectly if epinephrine were applied to it. From this Eliot assumed that the nerve impulse caused the secretion of an epinephrinelike substance at the myoneural junction, and that this new substance caused the muscle to contract. Since then many physiological experimenters, notably Leowi, have actually demonstrated that chemical substances are formed at the myoneural junction upon stimulation not only of the sympathetic, but also of the parasympathetic; in the former, epinephrine, and in the latter, acetylcholine. It was due to this discovery that our knowledge about the pharmacologic action of miotics was greatly increased.

In treating a case of glaucoma it would be ideal if we could know whether we were dealing with a failing ocular parasympathetic or a hyperactive ocular sympathetic. If the parasympathetic is at fault, is it because we have an underproduction of the acetylcholine or an over-

production of the esterase, or both? In the case of a predominant sympathetic, is there an overproduction of epinephrine-like substance or merely an increased sensitivity of the effector cells? All these questions are theoretical and cannot be answered at the present time. However, he believes it is reasonable to assume that there are several types of glaucoma, associated with various dysfunctions of the vegetative nervous system, and it is wise, therefore, to experiment with various drugs before deciding upon surgery.

Dr. Clarke has brought to our attention two new drugs, mecholyl and prostigmine, which are well worth a trial. Several of the cases reported by Dr. Clarke impressed Dr. Dunphy with their prompt response to this medication, particularly in cases of acute glaucoma in which pilocarpine and eserine had failed to bring the tension down to a satisfactory level. Dr. Clarke had done well to point out the dangers of injecting mecholyl and to take the precaution of having ready 1/100 grain of atropine as an antidote. Last year Dr. Dunphy injected 4/100 of a gram of mecholyl in a case of embolism of the central retinal artery in which the blood pressure was normal. Dr. Dunphy observed no change whatever in the dimensions of the retinal vessels. The systemic effect was rather startling, however. The patient complained of sweating, salivation, nausea, hot skin, dyspnea, and cardiac pain. Unfortunately the atropine was not ready for injection and a delay of five minutes took place which was about as uncomfortable for Dr. Dunphy as it was for the patient. The only other case in which Dr. Dunphy personally injected mecholyl was in an elderly man with tobacco amblyopia. The blood pressure was normal and the patient received 2/100 of a gram. The systemic reaction was very mild and no atropine was needed. No improvement in the patient's vision

took place after several injections. Dr. Dunphy said that in discussing the various actions of acetylcholine, Dr. Clarke did not mention the contraction of the recti muscles and the oblique muscles of the eye, which Duke-Elder pointed out in his address before this Society in 1930. Although this may be of no practical importance because of the small doses used by Dr. Clarke, it is interesting to remember that in larger doses a sharp contraction of all the extraocular muscles is induced, thereby causing a rise in the intraocular pressure. Dr. Dunphy felt that mecholyl and prostigmine are well worth a trial in certain cases of glaucoma where pilocarpine and eserine have failed to bring down the tension to normal.

Trygve Gundersen,
Reporter.

LOS ANGELES SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

November 28, 1938

DR. F. C. HERTZOG, *presiding*

MUCOUS-MEMBRANE GRAFTS IN OPHTHALMIC CONDITIONS (with motion pictures)

DR. HAROLD F. WHALMAN presented a paper on this subject. He stated that whenever it becomes necessary to supplement or to supplant conjunctival tissue for any reason whatever, nothing serves better than a graft of mucous membrane from the mouth. Skin exfoliates and sometimes becomes rough and irritating and may even cause corneal ulceration. Mucous membrane remains smooth and soft.

He said that such transplants may be useful in a number of conditions, such as recurrent pterygium, replacement of excised tissue growths, symblepharon, trachoma, vernal conjunctivitis, and colo-

bomata. It was his opinion that the most important part of the procedure was obtaining a sufficiently large, clean, untraumatized graft. Then it could be fixed anywhere on the globe.

Dr. Whalman asserted that the surgical treatment of pterygium appears simple enough, but when such a growth recurs two or even three times it is nothing short of exasperating and decidedly embarrassing even if the patient has stayed with the original operator, which is not usually the case.

He affirmed that most recurrences can be avoided by careful execution of certain details. It is important to excise all of the corneal growth, even taking thin slices of the superficial layers of the substantia propria if necessary. The hyalinized subconjunctival tissue should be thoroughly excised. Exact application of a new portion of the bulbar conjunctiva to run transversely to the previous direction of tissue and vessels is the last detail. McReynolds has emphasized these points.

He averred, however, that there seem to be certain incorrigible cases in which recurrences defy the usual procedure. In such instances a mucous-membrane-graft operation is appropriate. Thorough excision of the head of the growth and ablation of the entire growth are the proper preparation. Then the transplant is sewed into place with four black-silk corner sutures. It is preferable to bandage both eyes for three days and to remove the stitches on the fourth day when the graft will have completely taken, barring complications.

Dr. Whalman stated that symblephara are freed from their attachments and mucous membrane supplanted sufficient to cover slightly more than the area denuded, using interrupted stitches or in some cases running sutures. The author had not found a stent to be necessary.

He said that in trachoma where other measures have failed and there have been numerous recurrences of corneal ulcers, the following procedure is advocated. An incision is made parallel to and about three millimeters back of the margin of the upper lid through the conjunctiva and cartilage. The cartilage is separated back to the fornices and completely excised with the conjunctiva. The mucous-membrane graft is then sewed into place with two running sutures, one in the proximal conjunctival margin and one in the distal conjunctival margin of the excised area.

Dr. Whalman asserted that vernal conjunctivitis can be treated similarly to trachoma, but it is not always necessary to include the tarsal cartilage.

He said that a number of authors have recently written on the subject of mucous-membrane grafts. Spaeth, Green, and Rambo are among the American writers; the first named (Spaeth) being outstanding in versatility and the last (Rambo) notable for his voluminous experience.

Spaeth and Green use the buccal surface of the mouth. The former points out the necessity of avoiding the parotid duct, and advises suturing the edges of the wound from which the graft is taken.

Dr. Whalman stated that technically it is much easier to obtain mucous membrane from the lower lip. The lip can be easily turned down and out and a large area exposed without the necessity of working at difficult angles. Furthermore, in this region there are no salivary ducts to be avoided.

He said that in his experience it has not been necessary to suture the edges of the wound from which the graft is taken, as this area is promptly epithelialized in about four days in the same way that the tonsil fossae are quickly covered after tonsillectomy. He maintained that anti-septics appear to be entirely unnecessary

before or after excising the transplant, and may be a disadvantage as they tend to devitalize the graft or healing areas.

To avoid traumatizing the graft, Dr. Whalman prefers following a technique for excising the transplant similar to the manner in which a Wheeler graft is taken from the skin of the upper lid. Anesthesia is first accomplished by placing a sponge saturated with 10-percent cocaine between the teeth and the lower lip. Then a small amount of 2-percent novocaine with adrenalin is injected into the area to be excised.

He stated that the graft is outlined with the point of a long (33-millimeter) Graefe cataract knife. It need be only slightly larger than the area to be covered as there is less contraction in mucous membrane than in skin grafts. Then the long blade is inserted flat under the mucous membrane at the center of the upper border of the outlined area and stabbed through to the lower edge. A sawing motion carries the blade out to one extreme of the graft but not to completion. Then the blade is carried in the opposite direction to completion. The extremity of the first incision is cut with scissors and the graft is free. It can then be laid flat on the back of the hand for trimming off any excess submucous tissue with scissors. Being thin and fragile great care must be used in handling the graft. The procedure described avoids entirely the

use of traumatizing forceps in obtaining the graft. Forceps are used, but to a minimum extent in sewing the graft into position.

Discussion. Dr. Boyce stated that he had seen Dr. Whalman's work and that the results were very satisfactory.

Dr. Alfred Robbins showed pictures of a case in which he had used mucous membrane for the repair of an extensive symblepharon.

Dr. Reina said that he had used mucous-membrane transplants for the treatment of trachoma. He said that he obtained his grafts in a similar manner but advised suturing the denuded area from which the graft was obtained, even though his sutures frequently pulled out.

In conclusion Dr. Whalman pointed out that mucous membrane could be obtained from the lower lip with the greatest facility and emphasized excising the graft with a cataract knife in the manner described, in order to avoid trauma. He reiterated his opinion that it was unnecessary to sew the edges of the wound from which the graft is obtained, since epithelialization is smooth and sufficient. Stitches are very apt to pull out, as Dr. Reina mentioned, and only prolong the healing process. He further stated that antiseptics had been unnecessary in his experience.

Harold F. Whalman,
Editor.

AMERICAN JOURNAL OF OPHTHALMOLOGY

Published Monthly by the Ophthalmic Publishing Company

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NEXT INTERNATIONAL CONGRESS

When the last International Congress of Ophthalmology was held, at Cairo, Egypt, in December, 1937, Czechoslovakia still existed as an independent political entity, in the form established shortly after the World War.

Through most of the next year there were threats of international conflict. In April, the German Fuehrer, apparently fearing an unfavorable plebiscite by the Austrian people on the question of whether they should be annexed to Germany, cut the Gordian knot by forcible seizure of the little republic. In the following September the Munich conference between Chamberlain, Daladier, Hitler, and Mussolini (with Benes looking on as

a helpless victim of the great game of give and grab) called a halt to the mobilization which had been going on feverishly in four European countries. The Czechoslovakian lamb was shorn of Sudetan land and people and of military strength.

Not many months later the lamb was unceremoniously swallowed by one who had declared that his game of grab was limited to reabsorption by the German Reich of those German people who had been unrighteously detached from their nationalistic or linguistic brethren.

A resolution adopted at the Cairo Congress, in favor of holding the next Congress at Vienna in 1941, was based upon recognition of Vienna's traditional leadership in medical art and teaching. For

several generations that city had occupied its unique position in the brotherhood of medicine, first under the relatively liberal government of the old Austro-Hungarian empire, and latterly under the confused succession of régimes created by the bankruptcy and economic distress consequent upon the World War and the peace settlement.

In spite of many more or less wanton acts by the Austrian Socialists and their opponents, Austria had still preserved in large measure the traditions of free speech and independent thinking associated with the development of democratic institutions during the nineteenth and twentieth centuries. The very existence of the noisy Nazi party of Austria, prior to the forced Anschluss, was potent evidence of this fact.

It appears to be an open secret that the International Council of Ophthalmology, after some wavering because of the changed political situation, has decided that the next Congress ought to be held in Vienna. This resolution is said to have followed a statement that German ophthalmologists would not attend the Congress if it were held anywhere but in Vienna. Many American ophthalmologists will be disposed to doubt the wisdom of the Council's judgment. It would be a matter for regret if a Congress outside of Germany could not be attended by German ophthalmologists. But would it not be equally regrettable if a Congress in Vienna failed to attract the ophthalmologists from other countries who usually attend such gatherings?

It would be ridiculous to assume that the atmosphere of a congress held in Vienna under present conditions could be unconstrained; or that during such a Congress there could be anything approaching the freedom of speech and thought to which citizens of democratic countries, including the United States, are ac-

customed. Even as to medical matters, opinion in a "totalitarian" state is bound to be dominated from above, as witness certain views on heredity, and a recent German discussion of an epidemic of keratitis which to most readers must sound suspiciously nutritional in character but has not been so interpreted in the German medical press.

The average visitor to an international congress does not travel solely for consideration of scientific problems. He hopes to enjoy unhampered contact with the personalities, beliefs, and general outlook of distinguished colleagues of other lands. He has the usual curiosity of the intelligent tourist as to his social, economic, and political environment. None of these intellectual appetites can be satisfied in a totalitarian atmosphere. Moreover, in Vienna, many of the most illustrious among our professional colleagues have been deprived of the opportunity to practice their profession, or have been forced into exile, or may even be confined in concentration camps. Is such an intellectual atmosphere attractive for an international ophthalmological congress?

An esteemed correspondent, who recently called the writer's attention to the general understanding that Vienna had been selected for the next Congress, points out that, so far as American ophthalmologists are concerned, the time is much more propitious for a Pan-American than for a universally international congress.

The great republics of the Western Hemisphere are increasingly conscious of happy differences between their interrelationships and those of European political units. Europe offers little, North and South America much, hope of permanent peace and harmony. The American commonwealths are steadily being drawn closer in friendship, in economic understanding, and in the need for de-

fence against the traditional ambitions which characterize a large part of the European continent. There ought to be a still greater rapprochement between the commonwealths of North and South America. To such a policy the government of the United States is pledged, and to such an effort in the field of medicine the government is not unlikely to give needed financial support. An excellent air service is available between North and South American points.

Our correspondent suggests that a Pan-American ophthalmological congress should not be allowed to degenerate into a "cruise junket," but should have in the first place a serious scientific character and purpose; that its council should be organized with proper representation from every country of the hemisphere; and that the enterprise should be backed vigorously by national societies, leading ophthalmologists, and great educational institutions of the United States.

The proposal is thoroughly worthy of consideration. There hardly seems room for any great hope that, for the purposes of an ophthalmological congress, the international situation in Europe will have become much more attractive in 1941 than it is at the present moment. It is to be feared that under these conditions an international congress of ophthalmology held in Vienna might prove abortive.

W. H. Crisp.

VISION FOR MOTOR DRIVERS

Legal requirements for vision of drivers of automobiles and trucks on the highways show that there is an appreciation of the fact that good vision is needed. But the rules adopted do little to secure safety on the highways for either the drivers or those they encounter. The law

may require vision of 20/30; but does not specify the light in which the test should be made. Eyes with standard vision have been declared unqualified, because the light on the test card was so poor they could only read 20/40 in the test. At best, the test letters test only macular vision. That may be perfect, and other parts of the visual field so defective as to make the driver blind to important dangers.

The article by Luckiesh and Moss in our March number (p. 274) calls attention to the reduction of vision by reduced illumination. Persons may be "night blind" by congenital defect or chronic disease. It may also arise suddenly by acute disease or impaired retinal nutrition from vitamin-deficiency disease that is not thought of as affecting the eyes. Hereditary congenital night-blindness is found in people who seem to have very good vision in strong daylight. Boys may grow up without knowing they are color blind; and in retinitis pigmentosa marked night-blindness and great narrowing of the visual field may gradually develop without attracting attention.

Parents are generally very slow to admit that their children have defects of sight or hearing. A man who knew his boy's sight was not good was quite proud that his son was able to drive the automobile. The boy had myopia, choroidal atrophies; and his best vision was barely 6/60.

Patients with optic neuritis or papilledema, but whose vision generally continues good, are liable to a sudden blindness that may pass in a few minutes, or may last for hours; so that they are afraid to go on the street alone. Patients with tobacco or alcohol amblyopia are generally subject to great variations in their general visual disability; and they have not become conscious of these great variations, which may occur from differences of light adaptation in their eyes.

There are other sources of danger on the highways like the driver who has had "only one or two drinks," and has high alcoholic confidence in his ability to do anything. But such dangers do not justify taking risks with poor vision. It may be necessary to disqualify for night driving some who can safely drive during the day.

Edward Jackson.

LECTURES ON THE MOTOR ANOMALIES

In the August issue appeared the last of 12 lectures on "Motor anomalies" by A. Bielschowsky, an authority on the ocular muscles. These lectures were delivered before the Seventh Annual Mid-Western Clinic Course of the Research Study Club, Los Angeles, California, in January, 1938. The editors of this Journal consider themselves very fortunate in having been able to publish these lectures, as they constitute an outstanding contribution to the subject of ocular muscles.

In response to many inquiries as to whether these articles would be available in a single volume, the JOURNAL is pleased to announce that Doctor Bielschowsky has planned to have them published as a monograph. Our readers will be advised later how to obtain this monograph.

A brief analysis of the material may prove of interest. The first lecture covered the physiology of ocular movements starting with the consideration of anatomical arrangement of the visual pathways and normal and abnormal retinal correspondence. The author in his first paragraph recognizes that the field of these studies is probably the most difficult in ophthalmology. It is, perhaps, unfortunate that it is necessary to begin with abstruse consideration, but logically

there is no way to avoid it, and the author has made the subject as clear as it can anywhere be found.

The second lecture deals with the theory of heterophoria, and the third with its signs and symptoms. The fourth considers the etiology of strabismus, and is a classic in itself. Nowhere will one find a better exposition of the subject. This is followed by "The development and course of strabismus."

The sixth lecture has to do with principles of surgical treatment. Details are not given. This is in line with the general theory of these lectures in that they assume considerable preliminary ophthalmic knowledge. Details of operations for squint do have a certain importance, but any good method will prove satisfactory if the surgeon applies it with a thorough understanding of the underlying pathology, whereas the most perfect method is useless if the nature of the squint is not recognized.

Lectures seven and eight deal with the nature of ocular-muscle paralyses and the effects when individual muscles are involved. Lecture nine concerns group paralysis, and ten, the supranuclear, such as conjugate deviations and paralysis of convergence and divergence. Lecture eleven has to do with the etiological prognosis and treatment of ocular paralysis, and the last lecture is concerned with ocular spasms.

The whole series constitutes a profound and searching consideration of motor anomalies. The subject is dealt with from a philosophical standpoint that is, however, capable of practical application.

This monograph will be one that any ophthalmologist will be proud to have in his library.

Lawrence T. Post.

BOOK NOTICES

THE PRINCIPLES AND PRACTICE OF OPHTHALMIC SURGERY. By Edmund B. Spaeth, M.D. Cloth bound, 413 engravings, containing 1,031 figures and 4 colored plates. Lea and Febiger, Philadelphia, 1939. Price \$10.

To compile in one volume a comprehensive review of the world's literature on ophthalmic surgery, and to sift for the reader the chaff from the grain, is an undertaking that few busy ophthalmologists would choose. To evaluate from the standpoint of classical technique the many surgical procedures that have been described and advocated by four generations of surgeons is an heroic task in itself; then through personal experience to learn of the pitfalls of personal adaptability to one's own surgical practice is to give the fire test to material, both ancient and modern, that goes into the making of a comprehensive presentation such as the author has provided. The results of his endeavors as a reviewer, as a surgeon, and as a commentator are evident on every page of the book. The author's personality is revealed in every chapter. His opinion on surgical indications is clearly and unequivocally stated. His favorite technical procedures are made his own by being described and elucidated in his own manner of telling. Thus it becomes Spaeth's surgery. This is in keeping with the modern trend of medical book writing, an insistence of the book publisher that a worth-while medical book must contain information plus personality. The author has kept faith with the publishers. But this is not an adverse criticism. A volume such as the author has produced is not the treasure of a miser who seeks only to hoard gains for his own selfish glory. It is the fulfillment of a wish to pass on to others less gifted than he the fundamentals of a scientific practice of professional medical technical

accomplishments to the mutual advantage of his professional colleagues and their patients, and to pass this information on as a teacher and adviser. Therein lies the personality of this volume, and for this feature of the book its reception by those for whom it is intended will stand. It is not only a reference book—an authentic and a good one—it is a textbook in the true sense of that term.

The mechanical arrangement of the book is based on anatomical considerations. It begins with a chapter on anesthesia and glides easily through the author's favorite field of plastic surgery in more than 400 pages wherein he discusses conditions of the lids, orbit, and lacrimal apparatus and their treatment. There is no volume available that treats of this phase of the ophthalmologist's practice so exhaustively and so lucidly.

The remaining chapters of the book are devoted mostly to surgical considerations of disorders and diseases of the eyeball. Indications for surgical intervention as established by experience are conventionally described, but, none the less, are stated clearly with reasons based on principles of the best medical practice so that no one can be misled into adoption of any of the described surgical procedures without knowledge of the probable therapeutic result. It would seem that nearly all worthwhile operations are adequately described, most of them in the language of the originator of the technique or in that of an experienced surgeon-commentator. The author's style of presentation in this section of the book as well as in the first part is pedagogical, he is still the teacher. Operations succeed or fail on details, as every teacher knows. Therefore, if one must learn a new procedure from a text, as almost all of us must, a clear exposition of details is essential. Where description is difficult, diagrams or illustrations have been inserted, most of which are well

done in spite of the fact that not all of them are the author's own lucid drawings but adaptations from the originals. Too many illustrations in the usual run of publications are presented to illustrate a desired effect rather than to aid one in the maneuvers by which such an effect is accomplished. The author, of course, could not avoid this pitfall without assuming a sponsorship for ideas that did not originate with him. The illustrations are, on the whole, purposeful and instructive.

Minor errors in descriptions of operations and mistakes in references are to be found in any text of such proportions and are to be found in this volume, but so long as they are insignificant and apparent to anyone who is conversant with the literature of ophthalmology, there is no use in setting them up as criteria on which to judge the value of a good piece of work.

This most comprehensive and valuable textbook should be in the library of every person interested in ophthalmology.

W. L. Benedict

BULLETIN OF THE OPHTHALMOLOGICAL SOCIETY OF EGYPT, 1938, volume 31, session 35. 118 pages, Cairo, Imprimerie Misr S.A.E., 1939.

This bulletin follows the usual style of such publications with items on officers, council, members, rules and regulations of the society, and so forth. Eighty-two pages of the bulletin are given over to the communications presented before the society during the past year. These include a number of case reports of more interesting and perhaps curious manifestations

of the eye which do not lend themselves for purposes of review. Of the more reviewable reports are those by Dr. M. Riad Bey on cataract with cholesterol deposits, apparently a familial condition to be classified as a congenital anomaly; a "symposium" by several authors on the genesis of retinal detachment and its treatment by diathermy; and, finally, several papers on various tumors with a particularly interesting report on the radiological treatment of tumors of the sella region by Dr. Max Meyerhoff. While Dr. Meyerhoff believes that radiological treatment improves the vision of such patients and may even prevent destruction of the optic nerve by pressure, and check the progress of hypophyseal tumors, surgical intervention is really the only certain means of therapy.

L. A. Julianelle.

VIAS DEL NISTAGMUS (Nerve pathways of nystagmus). By Dr. Baudilio Courtis. 150 pages, 93 photomicrographs. Buenos Aires, Aniceto Lopez, 1938. Price not stated.

This monograph (teacher's thesis) presents an extensive historical review of previous work on nystagmus, tabulates several types of classifications of this disorder, and elaborates the author's own classification from anatomic, pathologic, and functional standpoints. The present classification covers various disturbances of the ocular proprioceptive sense and of the vestibular system. The author regards nystagmus as a reflex phenomenon.

George A. Filmer.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP
ASSISTED BY DR. GEORGE A. FILMER

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

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| 1. General methods of diagnosis | 10. Retina and vitreous |
| 2. Therapeutics and operations | 11. Optic nerve and toxic amblyopias |
| 3. Physiologic optics, refraction, and color vision | 12. Visual tracts and centers |
| 4. Ocular movements | 13. Eyeball and orbit |
| 5. Conjunctiva | 14. Eyelids and lacrimal apparatus |
| 6. Cornea and sclera | 15. Tumors |
| 7. Uveal tract, sympathetic disease, and aqueous humor | 16. Injuries |
| 8. Glaucoma and ocular tension | 17. Systemic diseases and parasites |
| 9. Crystalline lens | 18. Hygiene, sociology, education, and history |
| | 19. Anatomy, embryology, and comparative ophthalmology |

6

CORNEA AND SCLERA

Bonnet, P., Bonamour, G., and El Khalifah, M. Ocular chrysiasis (impregnation of the cornea and conjunctiva by gold). *Arch. d'Opht. etc.*, 1939, v. 3, May, p. 385.

Chrysiasis of the eye (the clinical manifestation of which is the impregnation of the cornea and conjunctiva by gold), observed in the course of prolonged treatment with salts of gold, presents an interesting problem of pathologic physiology. Corneal chrysiasis can only be detected by biomicroscopy. It has no effect on visual efficiency. In the shadow of the cornea adjacent to the light slit, one sees a purple reflex. The posterior surface of the cornea shows many extremely fine brick-rose-colored dots in the immediate neighborhood of Descemet's membrane. They are more dense toward the limbus, especially above and below. The nature of the gold salts plays no part in the aspect of impregna-

tion. It is necessary that the dose injected be sufficiently great. The minimum dose necessary is 3 gm. Chrysiasis of the conjunctiva reveals itself by its yellowish color, which on analysis is found to be due to lymphatic impregnation with fine dots around the capillaries of the limbal palisades.

Animal experiments were performed. Chrysalbine was used intravenously, and the rate of appearance of ocular chrysiasis was studied. Three methods of detection of the presence of gold in the ocular tissues are described. These are (1) chemical, (2) electrolytic coloration of a protein membrane, and (3) histospectography, which can be used clinically. The impregnation of ocular tissue (iris, sclera, cornea, and conjunctiva) with gold thus offers a method of vital staining which should lead to knowledge concerning ocular physiology. Gold is not present in the lens. (Colored plate, references.)

Derrick Vail.

Cornet, Emmanuel. Interstitial keratitis "soufflé." *Ann. d'Ocul.*, 1939, v. 76, April, pp. 297-300.

This lesion is formed primarily from an interstitial keratitis with its new-formed vessels. It is always associated with a trachomatous pannus and its separate vascularization. At the edge of the zone of parenchymatous infiltration the cornea swells, sometimes leaving epithelialized depressions which do not take fluorescein. Finally a third system of vessels invades the cornea as a vascularization of repair. The author believes that trachoma and syphilis are responsible, not tuberculosis.

John M. McLean.

Czokrász, Ida. Application of vitamin B in the treatment of hypovitaminosis of the eye. *Orvosi Hetilap*, 1939, v. 83, April, p. 365.

While the oral administration of vitamin B is not sufficient for the treatment of keratitis and pannus, subconjunctival injection of this vitamin and its local application in the form of an ointment gave the author very good results in treatment of keratitis dendritica and herpes zoster.

R. Grunfeld.

Grzedzielski, Jerzy. Interstitial keratitis. *Klinika Oczna*, 1939, v. 17, pt. 2, p. 137.

A very thorough review of the literature of the last ten years.

Ray K. Daily.

Le Guillas, Coulouma, and Van Var-seveld. Interstitial keratitis and arthro-periostic phenomena in the course of acquired secondary syphilis. *Arch. d'Ophth. etc.*, 1939, v. 3, March, p. 231.

A case of interstitial keratitis associated with arthritis and osteoperi-

ostitis with improvement following antiluetic treatment is described. The authors believe that the general treatment in acquired syphilis of the eye should be by neosalvarsan, while in congenital interstitial keratitis treatment should consist of mercury and its salts.

Derrick Vail.

Michaïl, D. Filamentous keratitis. *Arch. d'Ophth. etc.*, 1939, v. 3, March, p. 205.

After reviewing the literature and discussing the etiologic theories of filamentous keratitis (particularly that of lacrimal hyposecretion), three cases in elderly patients are reported. The condition followed trauma. The author concludes that filamentous keratitis is of trophic origin, resulting from a lesion of the sympathetic nerves in certain feeble individuals. Paradoxically, the three cases were cured by further ocular disturbance (surgery, a concurrent phlycten). (Bibliography.)

Derrick Vail.

Peyret, J. A. Rodent ulcer of Mooren. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, Oct., p. 527.

Description of a case of rodent ulcer of Mooren in a 35-year-old patient, with discussion of the etiology, pathogenesis, pathologic anatomy, diagnosis, prognosis, and treatment of this rare condition.

Edward P. Burch.

Rosengren, B. Treatment of ulcer serpens cornea with M.B. 693 (sulphopyridine). *Acta Ophth.*, 1939, v. 17, pt. 2, p. 209.

Six brief case reports illustrate the effectiveness of this drug in serpiginous corneal ulcers. Ray K. Daily.

Rubbrecht, R. Surgical treatment of affections of the cornea. *Bull. Soc. Belge d'Opht.*, 1938, no. 77, p. 18.

This is the third communication by the author under the above title. It concerns the treatment of superficial affections of the cornea by excision of the diseased tissue, and covering the denuded area with a thin flap from the bulbar conjunctiva. Ten clinical case reports are presented, in two of which the flaps failed to adhere, but the final results were so good in these latter cases that they led to a simplification of the operation. After simple excision of a corneal lesion it was noted that the normal curvature of the cornea was re-established after a few months and little if any astigmatism remained. On the contrary, if excision was combined with conjunctival protection the corneal curvature was not re-established. It seems to be a well-established fact that in the event of a lesion of the superficial layers of the cornea the epithelium bordering on the lesion displays great activity in behalf of repair, while the parenchyma plays an unimportant rôle in the restoration of tissue. In removing diseased corneal tissue it is important to carry the excision to the border of the normal tissue in order that the epithelium may be unimpeded in its restorative growth. (9 illustrations.) J. B. Thomas.

Schousboë, F. Some manifestations observed in North Africa of hereditary and acquired syphilis in the region of the limbus. *Ann. d'Ocul.*, 1939, v. 76, May, pp. 376-390. (See Section 5, Conjunctiva.)

Senger, W. Further reports of an epidemic conjunctivitis of unknown etiology. *Münch. med. Woch.*, 1939, v. 86, April 21, p. 607.

From various parts of Germany an epidemic of conjunctivitis or keratoconjunctivitis is reported which resembles in some ways keratitis nummularis (Dimmer). In Munich alone 500 cases have been reported during the past four months. The most frequently used names for this condition are: keratoconjunctivitis epidemica, and keratitis superficialis epidemica. The inflammation is of long duration, especially in those cases in which the cornea is affected; but it seldom leads to permanent impairment of vision.

Bertha A. Klien.

Smitmans, F. K. Keratoconjunctivitis epidemica 1938. *Med. Klin.*, 1939, v. 35, Feb. 24, pp. 235-237.

Since July, 1938, an epidemic keratoconjunctivitis has been reported from Berlin, Bonn, and Munich, while other parts of Germany have remained entirely free from it.

The disease begins with general malaise and slight increase of temperature, which are followed after a few days by the conjunctivitis, which is characterized by intense swelling of the palpebral conjunctiva, chemosis of the bulbar conjunctiva, and a mucoserous discharge. Hemorrhages are absent. The acute symptoms subside after eight or twelve days, and at that time the corneal manifestations begin. These consist of disciform infiltrates in the most anterior layers of the corneal stroma, densest in the pupillary portion, and often vesicular detachment of the epithelium. The epithelial lesions heal within a few days, but the parenchymatous infiltrates remain unaltered for many weeks. No vascularization of the cornea could, however, be observed. The disease is extremely infectious, and minor traumas (removal of a foreign body, repeated tonometries) are

predisposing for it. Although the disease resembles herpetic infection it cannot be considered a true herpes as experimental transmission to the rabbit cornea gave negative results.

Bertha A. Klien.

Stokes, W. H. Notes on experimental keratitis: An investigation of the cellular pathology with particular reference to the macrophages. *Trans. Amer. Ophth. Soc.*, 1938, v. 36, pp. 316-368.

An extensive review of the literature concerning researches on the cellular elements in inflammation and on the histopathology of experimental keratitis is given, together with the results of certain investigations by the author. In different groups of rabbits, trypan blue was injected intravenously, subconjunctivally, intracorneally, and into the anterior chamber. Twenty-four hours after the injection the eyes were enucleated and the corneas examined pathologically, with particular reference to vital staining of phagocytic cells. It was found that the corneal corpuscles were capable of phagocytosis and could be an early source of local formation of macrophages. This was not true of the endothelial cells.

George A. Filmer.

Tettamanti, J. Crystalline parenchymatous degeneration of the cornea. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, Oct., p. 519.

Report of a case in a 36-year-old woman of nonspecific interstitial keratitis characterized by crystalline deposits in the deep layers of the corneal stroma.

Edward P. Burch.

Turpin, R., Tisserand, M., and Sérané, J. Hereditary and congenital corneal opacities occurring in three generations and affecting monozygotic

twins. *Arch. d'Ophth., etc.*, 1939, v. 3, Feb., p. 109.

A family history of corneal dystrophy characterized by milky-white opacification of the entire cornea, more marked in the center. Biomicroscopic examination showed the opacity to consist of multiple flocculent white dots situated in the anterior stromal layers. There was no vascularization and the corneal sensitivity was not reduced. There were no other concurrent congenital anomalies. Visual acuity was reduced in all cases. The condition appeared in three generations and was obviously dominant. Monozygotic twins (females) in the second generation were identically affected. One transmitted the condition to a female offspring. Nothing is known regarding the pathogenesis. (Diagram.)

Derrick Vail.

Veil, P., and Sarrazin, L. Hereditary and familial megalocornea. *Ann. d'Ocul.*, 1939, v. 76, April, pp. 241-252.

Arguments from the literature for and against the thesis that megalocornea is an arrested form of partial buphthalmos are cited. The frequent development of cataract and dislocation of the lens is explained by the failure of the lens to enlarge with the rest of the anterior segment. Three cases are reported with the family tree, showing that megalocornea appeared as a sex-linked recessive character.

John M. McLean.

7

UVEAL TRACT, SYMPATHETIC DISEASE AND AQUEOUS HUMOR

Bonnet, P., and El Ani, C. Disseminated miliary granulations of the iris. *Arch. d'Ophth. etc.*, 1939, v. 3, March, p. 193.

Six cases are described in which, un-

der biomicroscopy alone, the iris showed disseminated small hemispherical projections, translucent and grayish-white in color. These were situated in the anterior stroma of the iris, in the area of the collarette, more abundant in the pupillary part. While they resembled Koeppe nodules in appearance, they were different in that there was no sign of uveitis, and that they did not lead to posterior synechiae. Four of the six cases showed other evidence of tuberculosis (scleritis, pulmonary involvement, and in one case choroiditis, both focal and disseminated). The other two showed no signs of general or local tuberculosis. The authors conclude that, while the presence of these granulations is suggestive, their exact significance cannot yet be determined, particularly since no histopathologic study has been made. (Colored plates.)

Derrick Vail.

Cecchetto, Ezio. Paracentesis of the anterior chamber in various ocular diseases. *Rassegna Ital. d'Ottal.*, 1939, v. 8, Jan.-Feb., p. 19.

Cecchetto reviews the history of paracentesis of the anterior chamber from the time of Galen. He then discusses the composition of the aqueous and its origin. The procedure has been found valuable in a great variety of pathological conditions, such as iritis, iridocyclitis, corneal diseases, retinitis pigmentosa, disorders of the circulation, and retinal separation. Twenty cases are reported in which paracentesis was performed one or more times.

Eugene M. Blake.

Ciotola, Guido. The significance of follicular formations in the choroid resulting from inoculation of trachomatous material into the vitreous. *Boll.*

d'Ocul., 1938, v. 17, Nov., pp. 929-941.

Into the vitreous of three series of rabbits, injections were made respectively of liquid obtained from centrifugation of trachomatous conjunctival material, from trachomatous material without centrifugation, and from non-trachomatous material (conjunctiva of dog; brain, liver, and spleen of guinea pig). Later these eyes showed signs of plastic endophthalmitis ending in atrophy of the eyeball. No follicular formation was found by microscopic examination of the eyes in the first series, while in eyes of the other series a lymphocytic infiltration was noted in the choroid and vitreous, in some places taking the shape of a true follicle. The writer believes that these follicular formations represent nonspecific reactions to the injected material acting as a foreign substance. (Bibliography, 7 figures.)

M. Lombardo.

Csillag, Ferenc. Essential iris atrophy and glaucoma. *Orvosi Hetilap*, 1939, v. 83, Jan., p. 85. (See *Amer. Jour. Ophth.*, 1939, v. 22, April, p. 461.)

Fixott, R. S. Massive doses of foreign protein in intraocular infection. *Northwest Med.*, 1939, v. 38, May 4, p. 165.

Two cases of exogenous uveitis each of which, through error, was treated with a single massive intravenous dose of 500 million typhoid organisms, are reported. Although marked, the reaction in neither case was alarming, and there was rapid resolution of the intraocular infection.

T. E. Sanders.

Heath, P., and Geiter, C. S. Some physiologic and pharmacologic reactions of isolated iris muscles. *Trans. Amer. Ophth. Soc.*, 1938, v. 36, pp. 213-

226. (See Amer. Jour. Ophth., 1939, v. 22, July, p. 791.)

Jaeger, Antoine de. Three cases of Adie's syndrome. Bull. Soc. Belge d'Opht., 1938, no. 77, p. 118.

In pupillotomy, or the syndrome of Adie, the characteristic symptoms include mydriasis, suppression of the photomotor reflex (under ordinary conditions), and especially synergism of the convergence reflex which develops very slowly but progresses to a supranormal contraction persisting for some time (Saenger's type). The author believes that the great merit of Adie was his observation that in addition to pupillotomy there often exists absence of tendon reflexes and that the affection is not of a syphilitic nature.

The phenomena of the lesion are produced by disease of the functions of the midbrain. The etiology may be due to various causes. Adie and Behr believe that, in view of the negative humoral reactions, syphilis is never the causative agent. However, the author states that this does not constitute proof, because other cases of syphilitic origin, such as tabes, present negative serologic reactions. As a result of his observations the author concludes that Adie's syndrome is more frequent than one would think; that it is closely related to true tabes from the point of view of symptomatology; and that in pure form the prognosis is favorable (even more so than in other forms of pseudotabes). However, it is a symptom and not a disease, and only after examination by a neurologist and examination of the cerebrospinal fluid can one positively eliminate syphilis. (References.) J. B. Thomas.

Post, M. H. Essential progressive atrophy of the iris. Amer. Jour. Ophth., 1939, v. 22, July, pp. 755-759.

Streiff, E. B. Moniliform pigmented streaks of the chorioretina. Boll. d'Ocul., 1938, v. 17, Oct., pp. 801-815.

The history is given of three women of 60, 70, and 80 years respectively, affected by hypertension and arteriosclerosis. Two were myopic. Retinal arteries were contracted, choroidal vessels sclerosed, and above and along the latter were seen masses of granules of black pigment, each separated from the other like a rosary string. The streaks started near the disc, and pursued a linear course in the direction of the choroidal blood vessels. The retinal blood vessels passed over them. The author believes that a close etiologic relation exists between the condition of the choroidal vessels and these pigimentary changes. (Bibliography, 6 figures.) M. Lombardo.

8

GLAUCOMA AND OCULAR TENSION

Archangelsky, P. T. Biomicroscopy of cicatrices after iridectomy and the operation of Elliot or of Heine. Arch. of Ophth., 1939, v. 21, April, pp. 598-601.

Based on a biomicroscopic investigation of fifty cases treated by Elliot trephining, twenty by cyclodialysis, and a few cases by iridectomy, the author concludes that the mechanism of the reduction of intraocular tension is the same. The disposition of the vessels developing in the region of the cicatrix is similar to that observed around a foreign body or an infiltrate, and these vessels form the additional system for the outlet of the aqueous.

J. Hewitt Judd.

Buchanan, J. A., and Ballweg, H. A. A case of myelogenous leukemia with glaucoma due to hemorrhage. Amer.

Jour. Ophth., 1939, v. 22, July, pp. 770-774.

Ciotola, Guido. Clinical observations on the behavior of ocular tonus in hypoglycemic coma. *Boll. d'Ocul.*, 1938, v. 17, Sept., pp. 738-754.

Ocular tension was studied in eleven patients subjected to insulin-shock treatment for schizophrenia. Results are given in tabulated form showing a hypotony in the majority of cases. The writer offers his explanation of the factors determining this hypotony which manifests itself in hypoglycemic coma less frequently than in diabetic coma. (Bibliography.) M. Lombardo.

Csillag, Ferenc. Essential iris atrophy and glaucoma. *Orvosi Hetilap*, 1939, v. 83, Jan., p. 85. (See Section 7, Uveal tract, sympathetic disease, and aqueous humor.)

Jackson, Edward. Tonometry and unusual cases of glaucoma. *Amer. Jour. Ophth.*, 1939, v. 22, June, pp. 614-615.

Kaminskaja-Pavlova, Z. A. The relation between intraocular tension and pupillary reaction to pain. *Viestnik Opt.*, 1939, v. 14, pt. 4, p. 29.

This investigation, made on 35 rabbits, consisted in pinching or pricking the skin of the nose at the exit of the branches of the nasal nerve, and recording immediately the pupillary reaction and the intraocular tension. The protocols show a raised intraocular tension in twenty cases, with a parallelism between the diameter of the pupil and the rise in tension. The rise in tension lasts from five to seven minutes, but the pupil contracts more rapidly. To throw some light on the genesis of these responses the author tested the effect of the aqueous of these eyes on the rhythm of the isolated

frog's heart. The kymograph tracings show an increase in the rhythm proportional to the rise in tension and the pupillary dilatation. The author believes that the active substances present in the aqueous are liberated by the vegetative innervation of the iris. (Kymograms.) Ray K. Daily.

Kirwan, F. O'G. Treatment of epidemic dropsy glaucoma. *Calcutta Med. Jour.*, 1939, v. 35, April 1, pp. 274-277.

The main ocular complication of epidemic dropsy is bilateral glaucoma of the noninflammatory type, usually occurring as a late manifestation of the disease. This disease is thought to be due to eating infected rice or mustard oil, the toxin producing a general dilatation of the capillaries and an increased permeability of their endothelial walls. In an attempt to expel the toxin from the body purgatives and large amounts of fluids are administered and rice and mustard oil eliminated from the diet. The only drug of use is ephedrine in large doses by mouth, local treatment with miotics being useless. If visual-field defects appear, immediate operation is advised, a modification of the Lagrange being recommended. T. E. Sanders.

Reitsch, W. Sclerenceleisis. *Klin. M. f. Augenh.*, 1939, v. 102, March, p. 326.

After detachment of a conjunctival flap a long scleral tongue is formed, 1.5 by 6 mm., and one half the thickness of the sclera. The base of it lies close to the limbus. The cornea is incised by shaving tracts subconjunctivally, and enlarging the incision to not more than 0.5 cm. The iris remains in situ. The scleral tongue is placed with a spatula in the corneal wound, and the conjunctiva is closed with two or three sutures. The four cases of

chronic absolute glaucoma operated upon by the author seem to prove that the implanted sclera prevents a permanent closure and secures a sufficient filtering opening for regulation of tension.
C. Zimmermann.

Rubino, A. Pressure and composition of the cerebrospinal fluid in patients with glaucoma. *Rassegna Ital. d'Ottal.*, 1938, v. 7, Nov.-Dec., p. 721.

The author studied the physiopathology of glaucoma, using the bromine quotient of Walter. He concludes that three fundamental factors are concerned: (1) physiologic and partial permeability of the capillaries of the eye, (2) hydrostatic pressure of the intraocular capillaries, and (3) colloidal osmotic pressure of the blood and ocular fluids. All three of these factors are altered in glaucoma, by (a) increase of capillary permeability, (b) increase of hydrostatic intraocular pressure, and (c) decrease of colloid-osmotic pressure.
Eugene M. Blake.

Schoenberg, M. J. A case of recurrence of ocular hypertension eighteen years after an Elliot operation. *Amer. Jour. Ophth.*, 1939, v. 22, July, pp. 774-777.

Shoji, Yoshiharn. A method of sclerectomy and the results of 248 glaucoma operations. *Arch. d'Opht. etc.*, 1939, v. 3, March, p. 217.

Shoji's sclerectomy appears to be a combination of cyclodialysis and use of a scleral punch. The incision, beneath a conjunctival flap, is 2 mm. from the limbus and 2 to 3 mm. wide. Following a cyclodialysis through this opening, small vertical slits are made toward the limbus, and the included piece excised with the scleral punch.

The conjunctival flap is replaced and sutured. The results from this operation are compared with those from other operations for glaucoma, and conclusions are given regarding the operation of choice in various types of glaucoma. (Tables.) Derrick Vail.

Stein, Ludwig. Left buphthalmos with hemihypertrophy of the left half of the face. *Klin. M. f. Augenh.*, 1939, v. 102, April, p. 541.

This partial gigantism occurred in an otherwise healthy boy of eight years, and was attributed partly to unequal development of the blood vessels and partly to neurotrophic disturbances. As the hypertension did not decrease under miotics, trephining was done and the cornea became clear.

C. Zimmermann.

9

CRYSTALLINE LENS

Agatston, S. A., and Gartner, S. Precocious cataracts and scleroderma (Rothmund's syndrome; Werner's syndrome). *Arch. of Ophth.*, 1939, v. 21, March, pp. 492-496.

The literature is reviewed and a case reported of this hereditary and familial disorder characterized by precocious development of bilateral cataract, early graying of the hair, scleroderma, premature senility, and various endocrine disorders. A history of consanguinity is usually found and the patients have a characteristic build: normal-sized trunk and small extremities. There is usually an early development of arteriosclerosis and hypertension. In addition to the usual findings, the case reported presented a fibroliposarcoma of the forearm. (Bibliography.)

J. Hewitt Judd.

Arruga, H. Percentage of total extractions in cataract operations. *Ann. d'Ocul.*, 1939, v. 76, April, pp. 300-303.

Arruga reports 528 cataract extractions performed in various foreign countries during the past 2½ years, 501 of these being extracted in capsule, 27 extracapsularly. Five hundred were attempted with forceps, 28 with the suction cup. No mention is made of visual results or complications.

John M. McLean.

Basile, Giambattista. Dinitrophenol cataract—experimental research. *Ann. di Ottal.*, 1939, v. 67, March, p. 223.

The author reviews the literature on dinitrophenol cataract. He administered this drug to a number of animals with the view of producing the form of cataract that had been observed in persons who had taken dinitrophenol for reduction of weight in obesity. In none were opacities found in the lenses, although there was a noticeable diminution in body weight of the animals examined. (Bibliography.)

Park Lewis.

Bertoldi, Maria. Heterochromia iridis, cyclitis, and cataract. *Rassegna Ital. d'Ottal.*, 1938, v. 7, Nov.-Dec., p. 738. (See Section 7, Uveal tract, sympathetic disease, and aqueous humor.)

Braun, R. The problem of diabetic lens changes. *Klin. Woch.*, 1939, v. 18, Feb. 11, pp. 209-213.

Among 600 diabetics the author found diabetic cataracts in three patients only. This type is different from the senile cataract, which develops in diabetics on an average of ten years earlier than in nondiabetics. The diabetic cataract develops in the young with a severe metabolic disturbance. It begins subcapsularly at the posterior

pole of the lens and progresses rapidly. In the early stages it is occasionally possible to arrest its progress or even to bring about a regression of the opacities by intensive insulin therapy. Its etiology is still obscure. We know, however, that neither the increased blood sugar nor the acetonuria plays an important part in its pathogenesis. The author suggests, as a possible etiologic factor, disturbance of the mineral and water balance, as emphasized by Gangström's theory, especially as he assumes that there is only a difference as to degree between diabetic cataract and the more frequent refractive changes in diabetics. He emphasizes the difficulty of animal and clinical experiment to support this theory. He was able to show by animal experiment, but not conclusively, that increase of sodium chloride in the blood was not followed by an appreciable increase in the sodium-chloride content of the aqueous.

The clinical experiment has to overcome the difficulty of reproducing in the healthy the disturbance of the mineral balance existing in the diabetic. In the normal individual any excess of sodium chloride is excreted instantly and the sodium-chloride content of the blood kept at a level. This mechanism can, however, be disturbed temporarily even in the normal individual, whenever the pancreas is overtaxed by high doses of dextrose. Experiments on normal individuals carried out under these precautions showed that no alterations of the refractive power of the lens could be produced.

Bertha A. Klien.

Bücklers, M. Evolution and involution of diabetic cataract. *Klin. M. f. Augenh.*, 1939, v. 102, April, p. 465.

In a man of fifty years a star-shaped

posterior cortical opacity observed at the beginning of diabetic treatment subsided within a few weeks. Simultaneously a transitory hypermetropia developed. Both processes were attributed to a transient absorption of water by the lens.

C. Zimmermann.

Crecchio, A. de. Behavior of the water content of the crystalline lens in experimental cataracta parathyropriva. *Ann. di Ottal.*, 1939, v. 67, Jan., p. 59.

The experiments were made on rabbits. The eyes of the animals were examined under the slitlamp; subsequently the right eyes were enucleated and the water content of the lenses determined. Two or three days later the rabbits were parathyroidectomized after the Lo Cascio method.

Weekly examinations of the lenses were made with the biomicroscope. At varying periods of time after removal of the parathyroids the animals were destroyed and the lenses removed in capsule, after which the water content in each case was determined. The increase in the water content of the lens was constant and notable, 14.30 percent in all of the lenses examined. These observations confirm the hypothesis that at least in some degree the hydriotic mineral balance in the crystalline lens is disturbed in experimental parathyroprival cataract, and they are viewed as illustrating the Redox-potential phenomenon in the light of modern theories of electric dominance in a biologic sense. (Bibliography.)

Park Lewis.

Dollfus, M. A., and Tetreau, H. A case of dolichostenomelia (Marfan's syndrome). *Bull. Soc. Belge d'Ophth.*, 1938, no. 77, p. 33.

A typical case of Marfan's syndrome

in a boy sixteen years old. Father and grandfather gave a history of chronic alcoholism. The patient presented lesions of the zonules of both eyes with subluxation of the lenses. The basal metabolism was normal. Mentality was subnormal. There were slight development of the testicles and alopecia of the pubic and axillary regions. The association of dolichostenomelia with these developmental defects of the genital glands inclines the author to attribute a glandular and probably hypophyseal origin to Marfan's syndrome. (Illustrations.)

J. B. Thomas.

Fisher, W. A. Senile cataract: the usual method of operating in India. *Amer. Jour. Ophth.*, 1939, v. 22, July, pp. 765-769.

Hambresin, L. Again the intracapsular operation. *Bull. Soc. Belge d'Ophth.*, 1938, no. 77, p. 91.

The author reviews the arguments for and against intracapsular extraction of the crystalline lens and describes at length his own operative methods. He finds it most effective to complete his anesthesia by retrobulbar injection of a small quantity (0.5 cc.) of a 2-percent solution of novocaine without adrenalin. He states that the whole secret of success with the intracapsular operation rests upon a corneal incision of not less than 180 degrees. The iridectomy must be broad. He makes no more than two attempts to remove the lens within the capsule, but if unsuccessful proceeds to perform the classical extracapsular operation. He believes it safest for both patient and operator that the latter should use the method with which he has had the most experience.

J. B. Thomas.

Horvath, R. Cataract operation with scleral suture. *Klin. M. f. Augenh.*, 1939, v. 102, April, p. 473. (See *Amer. Jour. Ophth.*, 1939, v. 22, July, p. 798.)

Hurtault, J., and Sverdlick, J. Total extraction of complicated cataract in a case with occluded pupil. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, Oct., p. 507.

Case report of a complicated morgagnian cataract in which the pupillary space was occluded by a new membrane, presumably of inflammatory origin. After separation of posterior synechiae, combined intracapsular extraction was successfully performed through the small operative coloboma of the iris. Subsequent examination revealed the presence of a grayish membrane in the pupillary area. There was no appreciable visual improvement after operation, because of a diffuse exudative choroiditis.

Edward P. Burch.

Kwaskowski, Adam. The hyaloid membrane after cataract extraction. *Klinika Oczna*, 1939, v. 17, pt. 2, p. 205. (See Section 10, Retina and vitreous.)

Måhlén, Sven. Tabulated ocular examinations of patients treated with dinitrocresol. *Acta Ophth.*, 1939, v. 17, pt. 2, p. 215.

This is a tabulated report of a re-examination of patients reported upon in a previous article (see *Amer. Jour. Ophth.*, 1939, v. 22, p. 799).

Ray K. Daily.

Meyer, F. W. Postoperative hemorrhages after cataract extraction and their causes. *Klin. M. f. Augenh.*, 1939, v. 102, April, p. 479.

At the eye clinic at Freiburg, Meyer found that hemorrhages after intra-

capsular were from 34.4 percent to 22.8 percent more frequent than after extracapsular extraction. The hemorrhages rarely occurred during operation, usually three or four days afterwards. Twenty-three percent occurred in men, 20.2 percent in women. Seasons had no influence. The possibility of small blood vessels being torn as a result of vitamin-C deficiency was tested in 35 cataract patients; no definite result was found, nor had intravenous calcium injections any effect. Emphysema was reported in 25.6 percent. A case of expulsive hemorrhage showed signs of arsenic poisoning; and since arsenic is used very much in the viticulture of that region and is consumed daily with large quantities of wine, its influence on the blood vessels is suggested. In some of the cases the hemorrhages could be ascribed to toxic disintegration of the capillary walls.

C. Zimmermann.

Müller, H. K. A. Vogt's criticism of my paper "On genesis of senile cataract." *Klin. M. f. Augenh.*, 1939, v. 102, March, p. 378.

A reply and correction of Vogt's criticism (*Amer. Jour. Ophth.*, 1939, v. 22, Feb., p. 230).

Noiszezwska, Kazimiera. Biomicroscopy of secondary cataract. *Klinika Oczna*, 1939, v. 17, pt. 2, p. 175.

The material studied consisted of secondary cataracts in 22 cases of senile and four cases of zonular cataract. The findings in 11 cases are described in detail. The conclusions are that the examination reveals the cause of diminished visual acuity, visualizes the constituent elements of the secondary cataract, differentiates an opaque hyaloid membrane from a secondary cataract, and facilitates the selection of the

most favorable site for discission. (Illustrations.) Ray K. Daily.

R Reese, A. B. Operative treatment of radiation cataract. *Arch. of Ophth.*, 1939, v. 21, March, pp. 476-485; also *Trans. Amer. Acad. Ophth.*, and *Otolaryng.*, 1938, 43rd mtg., p. 177.

As a basis for this report 112 eyes with radiation cataract were examined, and 25 eyes operated upon. Intracapsular extraction was done on sixteen, extracapsular extraction on six, and linear extraction on three. The histologic findings in the sixteen lenses removed in capsule are summarized and illustrated by photomicrographs. In cataracts caused by irradiation there is a tendency toward proliferation of the epithelium under the anterior capsule into a metaplastic fibrous layer. The anterior capsule is thus strengthened so that this type of cataract is particularly suitable for intracapsular extraction. Extracapsular extraction in such cases is contraindicated because the lens epithelium remaining after the nucleus is extracted may continue to proliferate and form dense fibrous tissue, which tends to produce iridocyclitis and secondary glaucoma. Some senile and some complicated cataracts also show a fibrous metaplasia of proliferated epithelium under the anterior capsule. This can be detected clinically even in the lesser degrees and is a factor in the successful removal of the lens in capsule. (Discussion.)

J. Hewitt Judd.

Tron, E. J. Studies on the chemical and physicochemical topography of the lens. *Viestnik Opht.*, 1939, v. 14, pts. 2-3, p. 59, and pt. 4, p. 6.

This laboratory investigation on oxen's eyes consisted in determining the changes produced by immersion of

the lenses in hypertonic salt solution, and in a solution of copper sulphate. The experimental saline opacities differ on the two lenticular surfaces. In the early stages large vacuoles are formed on the anterior lens capsule, and only fine transitory vacuoles on the posterior lens capsule. In the later stages the process varies on the two surfaces in intensity and extent. The opacities caused by immersion in copper sulphate consist of precipitated albumin, and they differ on the two surfaces in morphology, in time of appearance, and rapidity of growth. In partial removal of the lens capsule the changes in places denuded of the capsule were different from those formed in the presence of the capsule. Studies of the physicochemical properties of the lens show that the two capsules differ in permeability, in water and calcium content, and in the rate of dehydration and precipitation of albumin.

Ray K. Daily.

Vogt, A. Remarks on H. K. Müller's "A. Vogt's criticism of my paper on the genesis of senile cataract presented at Heidelberg." (See above.) *Klin. M. f. Augenh.*, 1939, v. 102, March, p. 383.

10

RETINA AND VITREOUS

Bedell, A. J. Traumatic retinal angiopathy. *Trans. Amer. Ophth. Soc.*, 1938, v. 36, pp. 188-198.

Three previously unreported cases of traumatic retinal angiopathy are presented by the author with a complete color-photograph record of one case. The literature is reviewed and the types of cases, differential diagnosis, and etiology are discussed.

David O. Harrington.

Bencini, Alberto. Bipolar electrolysis in the treatment of retinal detachment. *Boll. d'Ocul.*, 1938, v. 17, Sept., pp. 693-710.

The author reports eight cases of retinal detachment in which perforating bipolar electrolysis was used, the anode or active pole being 1.5 to 2 mm. distant from the inactive pole. A 20-ma. current was used for eight or ten seconds. Postoperative reaction was mild. The patients were from 22 to 56 years of age, and the duration of the detachments varied from nine days to five months. The detachments were of the diffuse type, not prominent. Six of the cases showed retinal tears, and in five cases the recovery was complete as seen from five to eighteen months after the operation. (Bibliography, 3 figures.) M. Lombardo.

Biró, Emeric. The relationship of endocrinology to retinitis pigmentosa. *Ann. d'Ocul.*, 1939, v. 76, April, pp. 293-297.

A brief review of the literature on the relationship of the endocrines to retinitis pigmentosa. Most of the evidence points to the pituitary as a major factor, particularly since it is known to be involved in some of the concomitants of retinitis pigmentosa, such as adiposogenital dystrophy and mental retardation. Some workers have also tried to implicate the gonads, thyroid, parathyroids, and liver. Ovarian extract seems to have shown some promise in therapy. John M. McLean.

Biró, Imre. Therapeutic experiments in cases of retinitis pigmentosa. *Brit. Jour. Ophth.*, 1939, v. 23, May, pp. 332-342.

This is an abstract of an address supplementing one given in 1934. The article describes the author's experience

with the use of three drugs: sexual hormones, amyl nitrite, and liver extract. Twenty-five patients, having been under observation for many years, were treated for the disease during the period from 1932 to 1938. Tables are presented to show visual acuity before and after treatment. The author finds none of the drugs to be specific for the disease, the true therapy remaining beyond present knowledge. (Tables. Figures.)

D. F. Harbridge.

Böck, Josef. Clinical and anatomic findings as to opticociliary arteries. *Klin. M. f. Augenh.*, 1939, v. 102, April, p. 529.

The predominating number of known opticociliary vessels are veins, while opticociliary arteries have been reported only four times. These are twigs of a branch of the central retinal artery which at the border of the disc turn into the deeper tissues. Böck ophthalmoscopically found opticociliary arteries three times in two patients and examined one of these eyes anatomically, thus being able to pursue the further course of the artery. In the right eye of one case the unusually large central artery coursed over the disc into the retina where it formed an arc and returned to the disc margin at which point it turned downward. The second case gives the first anatomic findings of an ophthalmoscopically visible opticociliary artery. The large central artery takes an atypical course and establishes communication with the ciliary vascular system.

C. Zimmermann.

Bruce, G. M. Retinitis in dermatomyositis. *Trans. Amer. Ophth. Soc.*, 1938, v. 36, pp. 282-297.

The literature on dermatomyositis is

very completely reviewed and the disease described. Three cases are reported having an unusual form of retinitis identical in appearance and behavior. Although other ocular signs have been noted in this disease, involvement of the retina has never been reported. David O. Harrington.

Contino, F. The question of the visibility of the hyaloid canal. *Ann. di Ottal.*, 1939, v. 67, Jan., p. 38.

About the middle of the last century Meissner observed an abnormality in the ocular fundus which he rightly interpreted as a vascular rest in the development of the vitreous. Since that time numerous clinicians have reported similar defects in which the hyaloid artery remained more or less as a functioning structure or became obliterated, leaving a persistent hyaloid canal. In accord with more modern scientific research the author proposes to consider the phenomenon as due to visibility of the canal of Cloquet. (This canal, while not normally visible under the slitlamp, may become so as a result of trauma or of intraocular hemorrhage.) He reviews under four groups the observations of other writers who have noted various forms of this morphology, and describes two cases. In one of these a hemorrhage into the vitreous was succeeded, as the blood was absorbed, by a peripapillary membranous formation extending forward to the postlenticular space. The second case was that of a child with exceedingly high myopia, in whom a lead-colored cylindrical cord extended from the posterior pole of the eye to the back of the lens. Its oscillation indicated a fluid vitreous. (Bibliography, 2 colored plates.) Park Lewis.

Filatov, V. P., and Verbitzkaja, E. A. Treatment of retinitis pigmentosa

with intramuscular injections of cod-liver oil. *Viestnik Opht.*, 1939, v. 14, pt. 4, p. 21.

Six brief clinical histories illustrate the effectiveness of parenteral cod-liver oil injections. The result manifests itself by improvement in light sensitivity as well as in visual acuity. The authors believe that the cod-liver oil effect is due not only to its vitamin content, but also to its influence on liver metabolism. (Visual fields.)

Ray K. Daily.

Fritz. The treatment of functional troubles of the retinal circulation. *Bull. Soc. Belge d'Opht.*, 1938, no. 77, p. 62.

The writer divides his methods of treatment into those that increase the perfusion of the retinal capillaries and those that lower excessive pressure. The former are further divided as to effects on the general circulation and effects on the retinal and intracranial circulation. The retinal circulation may be treated with general vasodilators administered by mouth or inhalation, or in other ways, or by local means such as miotics, ocular massage, and subconjunctival or retrobulbar injections. These local injections exert an important effect on the retinal circulation. The retinal vessels will not tolerate (without occurrence of edema, exudates, or hemorrhages) a capillary perfusion capable of allowing venous pulsations to persist beyond 100 mm. Hg of compression. Therapeutic measures that exceed this limit invariably cause accidents. In case of the injection of vasodilators the accident may tend to be localized in the eye. In treatment with ultrashort waves there is reason to fear that the effect may extend to the brain. Sphygmometric observations of the retina alone are capable of indicating the effects of treatment, so as to

control the intensity of the waves and thus insure safety. J. B. Thomas.

Graf, Cornélie. Detachment of the vitreous body. *Arch. d'Opht. etc.* 1939, v. 3, April, p. 314.

Thirty-eight cases (46 eyes) showing this condition were carefully studied and tabulated. It was present in 28 myopes, 7 emmetropes, and 3 hypermetropes, and was unilateral in 30 cases. It was most frequently seen in patients between fifty and sixty years old. Posterior detachment was most frequent (37 eyes). An oval or annular tear in the vitreous, varying in size, was frequently found. It is supposed that the tears come from the circumference of the papilla, but the author believes that the localization of the detachment has no influence on the form of the tear. Recent tears look like openings in a thin veil; after a time the edges contract, fold, and take the form of a band. Meshes and filaments are found in the margin, while the rest of the membrane has lost its tension, floating about more easily. Later the vitreous liquefies. Recent tears are always inclined in such a way that their superior border is directed forward, their lower border backward. The author dissents from the usual belief that detachment of the vitreous leads to that of the retina. (Illustrations, table, bibliography.) Derrick Vail.

Greig, M. E., Munro, M. P., and Elliott, K. A. C. The metabolism of lactic and pyruvic acids in normal and tumor tissues. 6. Ox retina and chick embryo. *Biochem. Jour.*, 1939, v. 33, April, p. 443.

Metabolism by the ox retina of lactate and pyruvate and various other compounds was studied. Oxidation in the retina is different from that in tis-

sues previously studied, such as the rat kidney. T. E. Sanders.

Jeandelize, P., Bretagne, P., Druesne, and Thomas, C. Retinal periphlebitis with hemorrhages and endocrine disturbances. *Bull. Soc. Belge d'Opht.*, 1938, no. 77, p. 40.

The authors report a case of retinal periphlebitis with multiple retinal hemorrhages in a woman aged thirty years who had a history of pulmonary tuberculosis (apparently healed), ovarian insufficiency, and hyperpituitarism. The question arises whether in certain cases of tuberculous periphlebitis there may not coexist an unrecognized endocrinopathy. The authors disclaim the idea of considering only the glandular point of view. There are the recurrent hemorrhages of juvenile retinal angiopathy, the obliterating thrombo-angiitis of Buerger, the recurrent hemorrhages of diseases of the blood and of various infections. The case under consideration, with its two possible etiologies, far from weakening the endocrine thesis, seems on the contrary to reinforce it and give it a more important basis of generalization.

J. B. Thomas.

Koch, F. L. P., and Walsh, M. N. Syndrome of tuberous sclerosis. *Arch. of Ophth.*, 1939, v. 21, March, pp. 465-475.

The authors review the literature and report the case of a boy aged seventeen years who presented findings typical of this condition, which is characterized by retarded mental development, epileptiform seizures, and tumors in one or more organs, usually the skin, brain, eye, liver, kidneys, heart, or occasionally the stomach. In this case the bilateral retinal tumefactions were associated with symmetrically distri-

buted lesions of adenoma sebaceum and a large calcified intracranial tumor probably invading the third ventricle. The etiology of tuberous sclerosis is unknown but the condition is probably hereditary. The classification of the retinal tumors is uncertain but they are likely astroblastic in origin, and therefore should be of a low degree of malignancy.

J. Hewitt Judd.

Kwaskowski, Adam. The hyaloid membrane after cataract extraction. *Klinika Oczna*, 1939, v. 17, pt. 2, p. 205.

Review of the literature and description of the biomicroscopic appearance of the hyaloid membrane, posterior lens capsule, and complicated and uncomplicated vitreous hernia, as seen in 45 postoperative cases. (Illustrations.)

Ray K. Daily.

Leinfelder, P. S. Retrograde degeneration in the optic nerves and retinal ganglion cells. *Trans. Amer. Ophth. Soc.*, 1938, v. 36, pp. 307-315. (See Section 11, Optic nerve and toxic amblyopias.)

Levitt, J. M., and Lloyd, R. I. Congenital prepapillary cyst containing a moving vascular loop. *Amer. Jour. Ophth.*, 1939, v. 22, July, pp. 760-764.

Levy-Wolff, Lizzie. Pathogenesis of retinitis pigmentosa. *Acta Ophth.*, 1939, v. 17, pt. 2, p. 192.

The author contends that retinitis pigmentosa is but a symptom of disturbed cerebral circulation; the process is that of a malignant angiosclerosis, initially of a nervous spastic type. The degeneration of the retinal ganglion cells is secondary to the progressive ischemia, caused by a disturbance in the sympathico-vegetative center in the

midbrain. The amaurotic idiocy of Spielmeyer-Vogt type is a variant of the same disease. The amorphous pigment in the equatorial region is a symptom of sclerosis in the choriocapillaris and the bone corpuscles indicate retinal involvement. The ring scotoma is the characteristic sign of the disease and represents a variant of bitemporal hemianopsia.

Ray K. Daily.

Muncaster, S. B., and Allen, H. E. Bilateral uveitis and retinal periarteritis as a focal reaction to the tuberculin test. *Arch. of Ophth.*, 1939, v. 21, March, pp. 509-511. (See Section 7, Uveal tract, sympathetic disease, and aqueous humor.)

Paterakis, Emanuel. Retinal angiospasm. *Arch. d'Ophth. etc.*, 1939, v. 3, Feb., p. 112.

Angiospasm is always a symptom, whether its cause be known or unknown. This symptom may be essential (spasm without apparent lesions), or secondary (spasm of hypertensive origin, arterial disease).

From a pathogenic viewpoint, it is necessary to distinguish: (1) reflex spasms of local origin (a good example of this form being the spasm observed in the evolution of a thrombosis of the central retinal artery); (2) spasms of general cause, the mechanism of which is almost unknown. One may admit the existence of spasm as a result of local reaction, variations of pressure (hyper or hypo), generalized sympathetic disturbance, or irritation of a humoral substance, but it is always necessary to explain the retinal localization. Therefore in the present state of our knowledge, classification is impossible. The prognosis in most of the cases is favorable and depends on the intensity and duration of the spasm. The treatment is

symptomatic and causal. (Bibliography.)
Derrick Vail.

Puntenney, Irving. Effect of certain chemical stimuli on the caliber of the retinal blood vessels. *Arch. of Ophth.*, 1939, v. 21, April, pp. 581-597.

The method described by Lambert was utilized for photographing, in the living animal, alterations in the caliber of the retinal blood vessels caused by the administration of certain drugs. Injections of epinephrine hydrochloride into sixteen dogs produced a questionable dilatation of the artery in two animals, with an increase in the caliber of the veins in seven. Nitrites were administered to seven dogs with negative results. Injections of mecholyl into twenty dogs produced a decrease in the caliber of the vessels in eleven and an increase in one. Ethyl ester of betamethylcholine was injected into two dogs, with no response. No increase in the caliber of the vessels was found after paracentesis. The author questions the efficacy of treating occlusion of the central arteries with vasodilators.

J. Hewitt Judd.

Riser, Couadau, Planques, and Valdiguié. Ophthalmoscopy in the hypertensive diseases. *Ann. d'Ocul.*, 1939, v. 76, April, pp. 252-274.

The value of ophthalmoscopic examination in cases of hypertension cannot be overemphasized. All the vascular and tissue lesions seen in arterial hypertension are reflected in the eye-grounds, and similarly all the fundus lesions have their counterparts elsewhere in the body. Red and white infarcts and areas of aseptic necrosis are seen similarly in brain, kidney, and heart. Central venous thrombosis in the retina corresponds to apoplectic lesions; retinal edema to cerebral edema.

In more than two thirds of the cases of low-grade papilledema and nearly all the cases of marked edema, increased intracranial pressure is present. The development of intracranial hypertension is an important event definitely modifying the prognosis. If one is to recognize the entity of malignant hypertension one must realize that edema of the disc often precedes the nephritis. It is not always possible to interpret choked disc in a patient with hypertension on the ophthalmoscopic picture alone. Neurologic, general medical, and laboratory examinations are indispensable.

John M. McLean.

Salus, Robert. The fundus oculi in generalized hypertension and arteriosclerosis. *Arch. of Ophth.*, 1939, v. 21, March, pp. 505-508.

The alterations in the fundus due to arteriosclerosis and hypertension are briefly discussed and their prognostic importance outlined. It is pointed out that the crossing arch often called "Salus' symptom" was first described by Marcus Gunn and is absolute proof of hypertension.

J. Hewitt Judd.

Schmidt, Rolf. Hole formations in the center of the retina. *Klin. M. f. Augenh.*, 1939, v. 102, April, p. 521.

Schmidt reports the clinical histories of fourteen cases of central hole formations of the retina in a total of 200 retinal detachments. In nine of the fourteen cases detachment was absent or was limited to the fovea centralis. In all fourteen cases the fundus picture remained essentially stationary. Since even the most successful operation does not restore central vision, and since even without treatment no deterioration of the condition and function of the eye occurs in most patients, no operation is indicated in macular holes

which do not entail a detachment beyond the wall of the fovea.

C. Zimmermann.

Streiff, E. B. Moniliform pigmented streaks of the chorioretina. *Boll. d'Ocul.*, 1938, v. 17, Oct., pp. 801-815. (See Section 7, Uveal tract, sympathetic disease, and aqueous humor.)

Stromburg, Günter. Familial occurrence of chronic inflammatory chorioretinitis. *Klin. M. f. Augenh.*, 1939, v. 102, April, p. 544.

Atypical chorioneroetinitis occurred in a father, his oldest son, and a daughter. In all three a gradually increasing deterioration of vision commenced in early youth. The father became blind at 44 years of age and the son partially blind at 27 years; the daughter at 18 years could count fingers at 0.5 meter. Ophthalmoscopically the discs were pale and atrophic, the blood vessels tortuous and showing grayish-white sheaths of infiltration, and there were fine displacements of pigment. The daughter presented commencing central degeneration of the retina. The vascular changes in the son and daughter were similar to periphlebitis proliferans. There were no signs of tuberculosis and Wassermann reactions were negative. C. Zimmermann.

Urechia, C. I., Vancéa, P., and Dragomir, L. Laurence-Moon-Bardet-Biedl disease. *Ann. d'Ocul.*, 1939, v. 76, April, pp. 274-293.

A typical case of this syndrome is reported. The complete syndrome includes: retinitis pigmentosa, polydactylism, adiposogenital dystrophy, mental retardation. Incomplete forms of the disease are also seen. (Bibliography.) John M. McLean.

Vogt, Alfred. Further observations of pigment lines of demarcation around retinal pigment tears. *Klin. M. f. Augenh.*, 1939, v. 102, April, p. 517.

Vogt demonstrated on several cases a dark zone of demarcation in the retina due to proliferation of pigment at the border of the detachment. This is interpreted as an expression of spontaneous tendency to healing in detachment of the retina.

C. Zimmermann.

Vogt, Alfred. Large hemorrhages in the vitreous from retinal tears. *Klin. M. f. Augenh.*, 1939, v. 102, April, p. 516.

An emmetropic man of 65 years suffered an intraocular hemorrhage upon violently blowing his nose, a few weeks after a fall on his head. Two months later Vogt found a covered hole of the retina. The cover contained a retinal vessel which had been ruptured in tearing off the cover. The tear was closed by catholysis and diathermy.

C. Zimmermann.

Vogt, Alfred. Photograph of a honeycombed macula in juvenile retinitis pigmentosa. *Klin. M. f. Augenh.*, 1939, v. 102, April, p. 519.

Cystoid degeneration of the macula was known histologically before being seen by redfree ophthalmoscopy. The present photograph shows the yellow zone of the cyst walls as proof of the yellow color of the living macula.

C. Zimmermann.

Weve, H. Congenital aphakia with hyaloid artery and retinal fold. *Ophthalmologica*, 1939, v. 97, May, p. 79.

The author briefly describes and illustrates the fundus of an eye which had a well-marked persistent hyaloid artery and retinal fold. The eye had

shown convergent squint since birth. All transitions between simple persistent hyaloid artery and so-called pseudoglioma caused by congenital retinal detachment have been found.

F. Herbert Haessler.

Winther, Erik. Abnormal course of retinal blood vessels of the same type found in a father and his son. *Acta Ophth.*, 1939, v. 17, pt. 2, p. 236.

The presence of cilioretinal arteries and optic marginal veins in father and son suggests that these anomalies may be hereditary. A review of the literature. (Illustrations.) Ray K. Daily.

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Donahue, H. C. Neuromyelitis optica. *Amer. Jour. Ophth.*, 1939, v. 22, June, pp. 661-663.

Johnson, L. V. Alcohol-tobacco (toxic) amblyopia treated with thiamin chloride. *Arch. of Ophth.*, 1939, v. 21, April, pp. 602-603.

In a series of five cases, treatment with thiamin chloride (vitamin B₁) gave marked clinical improvement. Sufficient studies were not made to ascertain the therapeutic value of nicotinic acid. J. Hewitt Judd.

Koff, Raphael. Gumma of the optic papilla. *Amer. Jour. Ophth.*, 1939, v. 22, June, pp. 663-665.

Krause, A. C. The biochemistry of the optic nerve. *Trans. Amer. Ophth. Soc.*, 1938, v. 36, pp. 297-307.

An investigation of the chemical constitution of the optic nerve, in which the quantities of the proteins, lipids, and water-soluble extractives were es-

timated. Their relation to the physiology of the optic nerve is discussed.

David O. Harrington.

Leinfelder, P. S. Retrograde degeneration in the optic nerves and retinal ganglion cells. *Trans. Amer. Ophth. Soc.*, 1938, v. 36, pp. 307-315.

Electrolytic section of the optic nerve anterior to the chiasm resulted in retrograde ganglion-cell and nerve-fiber degeneration. Retrograde ganglion-cell degeneration occurred after section of both optic tracts. Little or no degeneration was seen in the optic nerves after section of one or both optic tracts or of the chiasm in the midline.

David O. Harrington.

Marcos, V., and Lijo Pavia. The eyeground in cerebellar heredoataxia. Its importance for early diagnosis. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 2, pp. 430-434.

The authors report the cases of three brothers, the first two showing advanced characteristic symptoms of cerebellar heredoataxia, including atrophy of the optic nerve. The third showed only beginning optic atrophy, with no symptoms of the disease elsewhere. The authors agree with Sanger Brown that the ocular findings, besides being of great diagnostic value, are very early in appearance, and therefore represent one of the most important signs in diagnosing the disease.

Ramon Castroviejo.

Orzalesi, Francesco. Retinal arterial pressure in alcohol-tobacco amblyopia. *Boll. d'Ocul.*, 1938, v. 17, Nov., pp. 889-897.

The general arterial pressure, the retinal diastolic arterial pressure, and the ocular tension are given in tabular form for sixteen patients with this

form of toxic amblyopia. These cases have a tendency to retinal hypotension; some show a relative retinal hypotension and only a few a relative hypertension. From these findings the writer is not inclined to favor a vascular theory on the genesis of the optic atrophy in such cases; the relative ischemia and the pressure changes are not manifest enough to cause atrophy of the papillomacular fibers. (Bibliography.) M. Lombardo.

Rubino, A. Beneficial effects of intravenous iodine therapy in certain affections of the optic nerve. *Ann. di Ottal.*, 1939, v. 67, Feb., p. 140.

In various forms of retrobulbar neuritis as well as opticochiasmatic arachnoiditis, the author reports beneficial results from iodine therapy administered intravenously. Park Lewis.

Santoni, Armando. Primary glioma of the optic nerve. *Boll. d'Ocul.*, 1938, v. 17, Nov., pp. 942-957.

A girl of 10 years developed left exophthalmos at the age of 2 years. At 4 years, after a fall causing rupture and emptying of the eyeball, the eye appeared as a small atrophic structure situated in front of a soft elastic mass filling the entire orbit. Histologic examination showed the mass to be limited by a capsular formation and composed of gliomatous tissue with myxoid degeneration and cystic softening, originating from the optic nerve. (Bibliography, 7 figures.) M. Lombardo.

12

VISUAL TRACTS AND CENTERS

Fanchamps, Jacques. Traumatic lesions of the chiasm. *Bull. Soc. Belge d'Opht.*, 1938, no. 77, p. 126.

Two cases of fracture of the orbit with lesions of the chiasm are reported.

The fact that such cases are very rare is accounted for by the location of the chiasm in the depths of the skull. (5 references.) J. B. Thomas.

Harrington, D. O. Localizing value of incongruity in defects in the visual fields. *Arch. of Ophth.*, 1939, v. 21, March, pp. 453-464.

Careful quantitative perimetric studies are of great value in localizing cerebral lesions not only laterally but dorsoventrally, since asymmetry of incomplete homonymous hemianopsic defects in the visual fields is regularly present in lesions of the temporal lobe and decreases in amount the farther back the lesions are in the visual pathway. In occipital lesions the congruity of the field defect becomes absolute, extending even to minute irregularities. These defects are thought to be due to the dissociation in the temporal lobe of homologous fibers from corresponding retinal points and their gradual coalescence in the postparietal area. Ten cases are reported as examples of the findings in the various regions. J. Hewitt Judd.

Kanzer, M., and Bender, M. B. Spatial disorientation with homonymous defects of the visual field. *Arch. of Ophth.*, 1939, v. 21, March, pp. 439-446.

This condition was found in a patient with an infiltrating spongioblastoma multiforme in the right temporal lobe and with probable extension into adjacent areas. The "spatial agnosia" associated with a left homonymous hemianopsia produced a spontaneous tendency for the patient to direct the visual attention to the right and to ignore objects on the left. An abnormal perception of visual configuration resulted, with the patient having a tendency to "confabulate" about the per-

ception of objects toward the side of defective vision, indicating that apparently a remnant of vision was preserved in this field. J. Hewitt Judd.

Traquair, H. M. The field of vision and the anatomy of the visual nerve path. *Edinburgh Med. Jour.*, 1939, v. 46, Feb., pp. 83-94.

The anatomic structure and relationships of the visual pathway are reviewed in detail, with excellent correlation of the structure with defects in the visual fields as produced by clinical lesions at the various levels.

T. E. Sanders.

13

EYEBALL AND ORBIT

Butler, T. H. A case of postoperative endophthalmitis cured by prontosil. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 337.

A patient seventy years of age had the left lens extracted by the combined method and was discharged 21 days later. Ten days later there was some reaction, and 17 days later no corneal precipitates were present but the anterior chamber was filled with masses of dense yellowish exudate like a thick hypopyon. He was readmitted to the hospital and put on atropine and four tablets of white prontosil (sulphanilamide) four times a day. Three days later there was marked improvement, and ten days later the exudate had disappeared and the iris was free of injection. The capsular membrane was opened two months later and the eye remained free from injection with corrected vision of 6/12.

Beulah Cushman.

Ciotola, Guido. Microphthalmos and finger, malformations. *Boll. d'Ocul.*, 1938, v. 17, Oct., pp. 855-867.

A boy of two years, affected by left microphthalmos with signs of an old inflammatory process of the iris, showed also a polydactylism (six fingers) on the left and cryptorchidism on the same side. A girl of one year showed a right microphthalmos, coloboma of the iris and choroid, and bilateral syndactylism, the first two phalanges of the index and third fingers being united by a skin fold. In discussing the pathogenesis of the defects, the writer excludes an endocrine dysfunction because of the unilaterality of the lesions. The cryptorchidism of the first case would speak rather for delayed development. (Bibliography.)

M. Lombardo.

Czukurász, Ida. Epithelial inlay with Kerr material to form an eye socket. *Brit. Jour. Ophth.*, 1939, v. 23, May, pp. 343-347.

Two cases are reported in which a Kerr-material mold was used to hold in place the epithelial graft lining the eye socket. The Kerr material is a plastic which may be softened in hot water, molded into the socket, and allowed to harden at body temperature. This type of plastic operation is recommended because of its wide adaptability and simplicity of performance. (Illustrations, references.)

D. F. Harbridge.

Fine, Max. Gumma of the orbit. *Amer. Jour. Ophth.*, 1939, v. 22, June, pp. 595-602.

Janson, E. Orbito-palpebral cysts in microphthalmos. *Klin. M. f. Augenh.*, 1939, v. 102, March, p. 328.

A woman of 38 years had had since birth a tumor in the right lower lid which had recently increased in size. The patient wished to have it removed

on account of disfiguration. Under local anesthesia, through an incision along the lower orbital margin, the cyst was dissected as far as the apex of the orbit and excised. It consisted of a thin vesicle filled with fluid and a solid stalk which was severed from the microphthalmic eyeball in the depth of the orbit. It contained fine fibers of connective tissue with glandular and tubular tracts and its walls showed cylindric epithelium, essentially glial tissue. Orbitopalpebral cysts must be classed in the group of malformations arising from incomplete closure of the medullary tube with subsequent faulty differentiation. Spina bifida and syringomyelia are further examples. Orbitopalpebral cysts are analogous to malformations and tumors of the glioma group developing in the ventricular ependyma of the brain.

C. Zimmermann.

Krause, A. C., and Weekers, R. **Formic acid of ocular tissues.** Arch. d'Opht. etc., 1939, v. 3, March, p. 225.

A method of determining the amount of formic acid present in the cornea, iris, lens, vitreous, retina, choroid, sclera, and optic nerve is described. The possible role of formic acid in the metabolism of the hydrocarbons of the lens is briefly discussed. (Table, bibliography.)

Derrick Vail.

Meller, J. **Metastatic purulent uveitis of tuberculous origin.** Wiener klin. Woch., 1939, v. 52, June 9, pp. 545-546.

The left eye of a 48-year-old, kyphoscoliotic patient became spontaneously violently inflamed. Several weeks after the onset of the attack the vision was completely destroyed, and there were hypopyon and beginning tenonitis, which necessitated enucleation. The clinical diagnosis was of metastatic

ophthalmia of the type produced by streptococcic infection of unknown origin. The possibility of a tuberculous origin was also considered, as tuberculin tests (tebeprotein) and the complement fixation test for tuberculosis were positive.

In the histologic sections an extensive exudative process of nonspecific type prevailed, associated with extensive necrosis of retina, uvea, and sclera. In the neighborhood of these necrotic areas in the iris and ciliary body there were also small nodular excrescences composed of epithelioid cells. In these sections large numbers of tubercle bacilli were found by the Ziehl-Neelsen method. They were arranged in heaps within the necrotic detritus, especially along the pigment epithelium. This case illustrates that in acute, purulent, metastatic ophthalmia a tuberculous origin cannot be excluded.

Bertha A. Klien.

Meller, J. **Positive result of tissue culture in search for tubercle bacilli in an atrophic globe after a spontaneous iridocyclitis, and with atypical histologic findings.** Wiener klin. Woch., 1939, v. 52, April 14, pp. 349-351.

In an atrophic bulb without outward signs of inflammation the histologic examination revealed thick cyclitic membranes and their consequences. These indicated an atrophy following a severe, chronic iridocyclitis, with disseminated, nonspecific, fresh foci of round-cell infiltration throughout the uveal tract. Large parts of the eyeball were used for tissue cultures in search for tubercle bacilli. The cultures were positive.

Deductions by the author from the findings in this eye are: (1) that the tubercle bacillus may be present in a clinically entirely quiescent eye, and

(2) that tubercle bacilli may be present in an eye without the formation of typical tuberculous granulation tissue. Thus, lack of specific infiltration in the histologic specimen does not exclude the tuberculous nature of an inflammatory process.

Bertha A. Klien.

Walker, G. L. Fusospirochetal infection of the eye and orbit. *Amer. Jour. Ophth.*, 1939, v. 22, June, pp. 622-625.

Wauters, M., and Delcourt, R. Intra-orbital granuloma probably mycotic in nature. *Bull. Soc. Belge d'Ophth.*, 1938, no. 77, p. 165.

A case report with two photomicrographs.

Weve, H. Evisceration with excision of the scleral sac. *Ophthalmologica*, 1939, v. 97, April, p. 26.

Necrosis of the sclera is very common after exenteration of the eyeball in panophthalmitis, and this complication may prolong the healing time tremendously. To avoid it, the author advises excision of the sclera just anterior to the optic nerve. This is easy to do after evisceration if one first cuts the four straight recti at their insertions precisely as in preparing for enucleation.

F. Herbert Haessler.

14

EYELIDS AND LACRIMAL APPARATUS

Agnello, F. Angioneurotic edema and allergic conjunctivitis. *Boll. d'Ocul.*, 1938, v. 17, Oct., pp. 878-884.

Since her youth, a woman of 75 years had been hypersensitive to different stimuli, with manifestations of asthmatic cough, paroxysmal tachycardia, and urticaria. Recently, during the cold months she was subject to repeated attacks of edema of the eyelids accom-

panied by intense itching and lacrimation. The palpebral conjunctiva was hyperemic and showed numerous follicles. After a discussion on the etiology and pathogenesis of these anaphylactic disturbances, the author concludes that in this case the only causative element to be considered is the acquired hypersensitivity to cold weather.

M. Lombardo.

Bello, Domenico. Morphologic and etiologic genesis of oblique fissures of the face. *Boll. d'Ocul.*, 1938, v. 17, Nov., pp. 898-918.

A girl of 14 years had malformations consisting of ectropion of the left lower lid on its nasal side, a scar of the right upper lip resulting from an operation for harelip, and a depression of the region between the nose and left cheek. Her left eye was congenitally amblyopic with opacity of the cornea. The etiology and personal interpretation of the pathogenesis of these malformations are discussed. (Bibliography, 6 figures.)

M. Lombardo.

Csillag, Franz. Primary infection of the eyelids. *Klin. M. f. Augenh.*, 1939, v. 102, March, p. 388.

For three months a farmer of 28 years had had a reddish-brown hard swelling at the inner angle of the left lower lid, showing a yellowish secretion which could not be wiped off. Later the corresponding part of the upper lid and the face and neck to the region of the left ear developed the same kind of swelling. The conjunctiva, plica, and canaliculi were thickened and hyperemic. The pre-auricular lymph gland and the mandibular angle were swollen. Wassermann reaction was intensely positive. The affection was relieved by salvarsan treatment.

C. Zimmermann.

Cuesta Yañez, Carlos. Treatment of blepharitis with bismuth chloride. *Rev. Oto-Neuro-Oft.*, 1938, v. 13, Nov., p. 273.

A report of five cases of chronic blepharitis treated successfully by the local application of bismuth chloride paste. Edward P. Burch.

Gifford, S. R. The Hughes procedure for rebuilding a lower lid. *Arch. of Ophth.*, 1939, v. 21, March, pp. 447-452.

This procedure (see *Amer. Jour. Ophth.*, 1938, v. 21, Jan., p. 104), which is exceedingly useful for rebuilding all or part of the lower lid when the conjunctiva must be removed, gives results superior to those obtained with pedicled grafts. Three cases are reported illustrating minor complications which may be obviated by a few technical details not mentioned in the Hughes article. There is need for adequate drainage (accomplished by leaving an opening at both the inner and the outer angles), as retained secretion evidently promotes granulation tissue along the suture line. Uniting the layers of the new borders of the lid by sutures is unnecessary and should be omitted as it is likely to cause entropion. When there is loss of skin caused by radiation or cicatricial contraction after other operations, the author suggests that a flap be fashioned according to the Hungarian method so that no skin from the upper lid need be sacrificed, and that the separation of the lids be delayed for one or two months longer than usual so as to minimize the contraction. J. Hewitt Judd.

Hermans, René. Blepharochalasis. *Bull. Soc. Belge d'Opht.*, 1938, no. 77, p. 155.

A case report of this curious affection of the lids which has been attributed to many causes, including angioneurotic edema, endocrine disease, and tuberculosis. (9 references, 1 plate.) J. B. Thomas.

Kreiker, A. Simplified tarsoplasty for cicatricial ectropion. *Ophthalmologica*, 1939, v. 97, May, p. 69.

The author describes an operation which modifies Blascovics' operation in such a way as to simplify the procedure and to make a satisfactory result more certain. Of utmost importance is the insertion of three sutures through the skin to evert the lid. An incision is made through conjunctiva and tarsus parallel to the lid edge, 2.5 mm. from it (just through the typical scar in the sulcus subtarsalis), through the entire length and thickness of the tarsus, and at a right angle to its surface. Three sutures are then placed through the distal and proximal positions of the tarsus in such a manner as to tip the lid edge forward after the sutures have been tied. A double-armed suture enters through the conjunctiva behind the proximal portion of the tarsus and emerges at its free edge. At this point in the operation, the skin over the distal portion of tarsus is undermined from behind to free the connections between the tarsus and the skin muscle plate. The sutures then enter the distal portion of the tarsus through its anterior surface and emerge at its posterior surface and through the skin at the free lid margin, where they are tied. These sutures must be placed with the utmost care so that they pass through corresponding points on the two parts of the tarsus. One strives for overcorrection which disappears in time. The writer has never noted permanent overcorrection.

F. Herbert Haessler.

Nicolato, A. A consideration of certain results in reconstruction of the palpebrae following removal of tumors and extensive injuries. *Ann. di Ottal.*, 1939, v. 67, Feb., p. 81.

When extensive destruction of the palpebral tissues has occurred the author considers that careful preoperative consideration must be given to the plan of procedure to be followed, as each individual case requires special study. There must be complete understanding between the patient and the physician in order that the ethical, moral, and material results shall be satisfactory. When extensive destruction of tissue is involved, early reparative measures should be taken. The article is extensively illustrated showing results, but the methods employed are not described. (12 plates, 46 figures.)
Park Lewis.

Theobald, G. D., and White, C. J. Radium in the treatment of chalazion. *Amer. Jour. Ophth.*, 1939, v. 22, July, pp. 750-754.

Tooke, F. T. A case of aleukemic lymphosis involving the upper lids, with pathologic findings. *Trans. Amer. Ophth. Soc.*, 1938, v. 36, pp. 268-278.

A case is reported in which the lymphoid tissue of the upper lid was the seat of marked proliferation such as might be seen among the somewhat immature forms of lymphatic leukemia. The condition responded to radiation therapy. The author emphasizes the difficulty in classification of these types of tumors and believes that no exact classification is possible. He feels that many of these conditions, even though unlike clinically, form an interrelated series with no sharp lines of separation but a gradual transition from one into the other. David O. Harrington.

Tristaino, L. Congenital elongation of the inferior lacrimal canaliculus. *Rassegna Ital. d'Ottal.*, 1939, v. 8, Jan.-Feb., p. 3.

The author describes an example of elongation of the lower canaliculi in a three-year-old child. The condition is congenital and bilateral, and is accompanied by bony changes of the skull, especially a manifest craniofacial defect. There is an increase in the size of the root of the nose, the puncta are displaced temporally, and changes may occur in the caruncle. Frequently one finds epiphora, dacryocystitis, conjunctivitis, and blepharitis. (1 figure.)

Eugene M. Blake.

Valerio, Mario. Surgical treatment of ptosis. *Rassegna Ital. d'Ottal.*, 1939, v. 8, Jan.-Feb., p. 62.

Valerio believes that the operation of Nida is probably the best procedure for most cases of ptosis. This operation consists in freeing the superior rectus, dissecting a narrow strip from the upper edge of the superior tarsus (left attached at the nasal end), and passing the strip of tarsus beneath the elevated superior rectus. The temporal end of the strip is then reunited to the tarsus, forming a sort of pulling attachment between the superior rectus and the upper lid. The author reports six cases satisfactorily treated by this method. (10 figures.)

Eugene M. Blake.

15

TUMORS

Argaud, R., and Calmettes, L. Remarks on certain specific anatomopathologic characteristics of mixed tumors of the lacrimal gland. *Arch. d'Opht. etc.*, 1939, v. 3, May, p. 395.

Mixed tumors of the lacrimal and

salivary glands resemble one another very closely. The differential characteristics of these tumors spring from a double modality, histologic and histogenic. The hypothesis is advanced that mixed tumor of the lacrimal gland is the result of a delayed and disordered evolution of one of the embryologic buds, which has remained in a latent state, possessing the tissulogenous omnipotence of embryonic ectoderm. (Illustration.) Derrick Vail.

Castrén, H., and Teräskeli, H. A rhabdomyoma of the upper eyelid. *Klin. M. f. Augenh.*, 1939, v. 102, March, p. 372.

A slowly growing tumor in the right upper eyelid of a boy of three years was removed surgically. The tumor recurred and in spite of radical exenteration of the orbit followed by roentgen and radium radiation, grew again and caused death. Histologically the primary tumor was multicellular and polymorphous containing cells like striated muscle fibers. The relapsed tumor was multicellular, very polymorphous like a sarcoma, and the cells showed no transverse striations.

C. Zimmermann.

David, M., Halbron, P., Bregeat, P., and Askenasay, H. The gliomas of the chiasm. *Arch. d'Ophth. etc.*, 1939, v. 3, May, p. 411.

This excellent review of the subject comprises an analysis of the ocular symptoms (visual disturbance, field defects, and primary optic atrophy) and the extraocular symptoms (hypothalamic, intracranial hypertension). The radiologic signs are important and may show a gourd-like excavation of the sella and enlargement of the optic foramina. The evolution, pathologic anatomy, and differential diagnosis are

adequately discussed. Surgical treatment, except in complete blindness, should not be used. Better results are obtained with X-ray treatment. (Illustrations, bibliography.)

Derrick Vail.

Ellett, E. C. (a) Leiomyoma and (b) hematoma of the iris. *Arch. of Ophth.*, 1939, v. 21, March, pp. 497-504; also *Trans. Amer. Ophth. Soc.*, 1938, v. 36, p. 98.

The first of these rare conditions occurred in a man aged 47 years, and resembled a sarcoma. The hematoma of the iris was found in a man aged 53 years, and was removed by iridectomy. The absence of a definite cyst wall suggests that the cyst was formed by closure of one or more of the crypts of the iris. (One color plate, photomicrographs.) J. Hewitt Judd.

François, Jules. A case of melanoma of the choroid of atypical development. *Bull. Soc. Belge d'Ophth.*, 1938, no. 77, p. 180.

Two photomicrographs illustrate the text.

Kreibitz, Wilhelm. Traumatic origin of sarcomas of the choroid. *Klin. M. f. Augenh.*, 1939, v. 102, March, p. 333. (See Section 16, Injuries.)

McCool, J. L. Mixed-cell tumor of the lacrimal sac. *Amer. Jour. Ophth.*, 1939, v. 22, July, pp. 734-743; also *Trans. Amer. Ophth. Soc.*, 1938, v. 36, p. 54.

Satanowsky, P., and Cramer, E. Another case of dyctioma of the ciliary body. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, Oct., p. 523.

A case of dyctioma of the pars plana of the ciliary body in a six-year-old

child is reported with histopathologic description of the tumor mass.

Edward P. Burch.

Stieren, Edward. The intranasal approach for removal of certain orbital tumors. *Pennsylvania Med. Jour.*, 1938, v. 41, July, p. 892.

The author reports a case of orbital osteoma arising from the ethmoid cells. After removal of the middle turbinate and the ethmoid cells, an opening was made from the nose into the orbit. However, the tumor was found to be too hard and too large to pass through this aperture, so the external route of removal was employed.

George A. Filmer.

Thiago, C. S. Telangiectasic granuloma of the eyelids. Botryomycoma. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 2, pp. 411-412.

Report of pediculated growth 15 by 15 mm. attached to the edge of both the upper and lower lids of the right eye near the canthus. The tumor seemed to spring from the margin of an angiomaticous nevus, extending through the right side of the nose. It bled easily and had been growing steadily since the onset two months previously. Excision was performed with the galvano-cautery. The growth began to recur four days later, necessitating the application of radium, which effected a permanent cure. Microscopic study revealed the excised tissue to be a telangiectasic granuloma with secondary fibrinopurulent inflammation. Differential diagnosis is briefly discussed.

Ramon Castroviejo.

Weiterschau, J. Radiation treatment of glioma retinae. *Klin. M. f. Augenh.*, 1939, v. 102, March, p. 359.

In the so-far-published fourteen

cases, cure of glioma can be attributed to irradiation therapy only with some probability. Spontaneous cures have been observed, and on the other hand the quantities of radiation used in different cases vary so greatly that uniform appreciation is impossible. Glioma patients show a far better prognosis as to life after enucleation than after treatment with irradiation. Operation in each case is absolutely necessary and should be performed as early as possible. Milder radiation therapy is only an unnecessary loss of time; its result is generally a blind phthisical eye which on account of painful secondary glaucoma has still to be removed. The author's own case of bilateral glioma in a child of two years, the clinical history of which is presented in detail, shows that in such eyes, shrunk after most intense radiation and electro-coagulation, tumor masses can still be found (metastases). These experiences make enucleation of the affected eye in unilateral glioma imperative. In bilateral glioma, irradiation of the second eye after enucleation of the more severely diseased eye is so far an unsatisfactory procedure.

C. Zimmermann.

16

INJURIES

Backeland, W. Reaction of the pigment epithelium in perforations of the eyeball. *Bull. Soc. Belge d'Ophth.*, 1938, no. 77, p. 13.

The treatment of detachment of the retina has given impetus to the study of experimental adhesive choroiditis. The author has conducted experiments on rabbits in which the choroiditis was induced by suture. He noted that mitoses in the pigment layer did not begin before the fourth or fifth day,

when the wound of the globe was already closed and the ocular tissues had begun to quiet down. (4 photomicrographs.)
J. B. Thomas.

Fontana, Giuseppe. Tissue reaction to metal in the globe. *Rassegna Ital d'Ottal.*, 1938, v. 7, Nov.-Dec., p. 695.

Fontana introduced chips and filings of bronze and of aluminum into the anterior chamber and vitreous of rabbits. He finds that the ocular tissues react to the presence of salts of copper by exudation, leucocytosis, and phagocytosis, tending towards the expulsion of the foreign body. On the other hand, the rabbit eye is very tolerant of particles of aluminum, both clinically and histologically. (7 figures.)

Eugene M. Blake.

Kreibig, Wilhelm. Traumatic origin of sarcomas of the choroid. *Klin. M. f. Augenh.*, 1939, v. 102, March, p. 333.

Seven cases (two in the adnexa and five intraocular) are reported. To accept a causal relation between trauma and tumor it must be shown that definite trauma has occurred, that a primary lesion of tissue is present, and that there has been no previous pathologic change at the place of injury. Changes, not only at the place of lesion, but of the entire uveal tissue, may be the basis for the formation of tumors. A long latent period speaks for an etiologic connection more than a brief one, if tissue changes have taken place. Disposition to formation of tumors and familial factors are discussed.

C. Zimmermann.

Pether, G. C. Treatment of lime in the eye. *Brit. Med. Jour.*, 1939, April 1, pp. 668-670.

The power of various neutral solutions to dissolve lime was calculated

by experiment. It was shown that ammonium chloride was more effective than any solutions which have hitherto been generally employed. It was tried in 4-percent solution on a series of cases, with considerable success. Preliminary application of an analgesic solution, and mechanical removal of large particles, should also be included in first-aid treatment.

T. E. Sanders.

Scheyhing, Hans. Localization of a piece of iron firmly embedded in the retina by catholysis (Vogt), and following, diascleral extraction with hand magnet. *Klin. M. f. Augenh.*, 1939, v. 102, April, p. 540.

This illustrates the possibility of exact localization of an intraocular foreign body by catholysis.

C. Zimmermann.

Sjögren, Henrick. A contribution to our knowledge of the ocular changes induced by sulphuretted hydrogen. *Acta Ophth.*, 1939, v. 17, pt. 2, p. 166.

A review of the literature and a report of two cases of keratitis in paper-mill workers. With photophobia, lacrimation, conjunctival congestion, and pain the unique feature of the cases was a rapid drying of the cornea on keeping the lids apart. The cornea became uneven in appearance and the pain intense; a blinking movement sufficed to render the cornea even again. The cornea did not stain with fluorescein, but did stain with rose bengal. Recovery was spontaneous in a few days.

Ray K. Daily.

Taliercio, A. X-ray cataract. *Ann. di Ottal.*, 1939, v. 67, Feb., p. 104.

The author irradiated one eye in each of several rabbits and obtained lenticular opacities from 38 to 110 days

after the irradiation depending upon the duration of exposure to the rays. The following changes were noted from the beginning of the irradiation: modification of the pH of the aqueous, with displacement toward the alkaline zone; increase in the weight of the lens from 4 percent to 8 percent; small but measurable increase in the calcium content of the lens; and diminution of the anaerobic glycolysis of the cortical substance.

The author concludes that lenticular opacities caused by roentgen rays are neither directly nor indirectly the result of chemical endocular changes, but rather are caused by action of the rays on the elements of the capsular epithelium which generate the lens fibers. (Bibliography.) Park Lewis.

Wibo. The hygiene of swimming pools; ocular ulceration of chemical origin. *Bull. Soc. Belge d'Opht.*, 1938, no. 77, p. 183.

The report concerns a case of acute inflammation of one eye, beginning with sudden pain while in a swimming pool and developing into a severe and extensive ulceration of the lower lid and bulbar conjunctiva. The author believes that this local cauterization was caused by a crystal of hypochlorite introduced into the pool in the Javel solution used as a disinfectant. He suggests that all disinfecting solutions be carefully filtered before mixing them with the water of the pool.

J. B. Thomas.

17

SYSTEMIC DISEASES AND PARASITES

François, Jules. Ocular manifestations in a case of myeloid leukemia. *Bull. Soc. Belge d'Opht.*, 1938, no. 77, p. 47.

The patient, a woman 53 years old,

had first manifested symptoms of leukemia about 1½ years previous to consulting the author concerning poor vision. Examination of the eyegrounds revealed a profuse hemorrhage into the vitreous of the right eye; in the left eye the veins were dark and dilated, the arteries tortuous but no paler than normal. The patient presented none of the characteristics of the retinopathy of leukemia. The aspect of the fundus of the left eye resembled closely that of erythremia, the disease of Vaquez. Only a blood analysis could differentiate them. (Illustration.)

J. B. Thomas.

Gekker, I. P. The pathology of the eye in pregnancy. *Viestnik Opht.*, 1939, v. 14, pt. 4, p. 60.

Reports of three cases: One, a case of acute conjunctivitis simulating diphtheric conjunctivitis with severe corneal ulcers in a woman in the sixth month of pregnancy; simultaneously, two other members of the family were affected with a conjunctivitis which ran the usual course. A case of angiospasm in a pregnant woman with cardiovascular disturbances, and a case of hysterical blindness, are the other two reported. Diseases of the retina and optic nerve are apt to recur with each pregnancy.

Ray K. Daily.

Gonçalves, Paiva. Malarial trigeminalgia. *Trabalhos do Primeiro Cong. Brasileiro de Opht.*, 1936, v. 2, p. 513.

Report of a case of severe pains along the territory innervated by the trigeminus. Complete examination revealed the patient to be affected with malaria. Specific treatment of the malaria cured the neuralgia, proving the specific cause of the affection.

Ramon Castroviejo.

Jeandelize, P., Bretagne, P., Druesne, and Thomas, C. Retinal periphlebitis with hemorrhages and endocrine disturbances. *Bull. Soc. Belge d'Opht.*, 1938, no. 77, p. 40. (See Section 10, Retina and vitreous.)

Kuhn, H. S. Adrenal neuroblastoma and its ocular symptoms. *Amer. Jour. Ophth.*, 1939, v. 22, June, pp. 642-648.

Mangabeira-Albernaz, Paulo. The syndrome of Charlin (syndrome of the nasal nerve). *Arch d'Opht. etc.*, 1939, v. 3, May, p. 398.

Irritation of the nasal nerve produces a group of ocular and nasal symptoms which Charlin first described. The syndrome is made up of three parts: (1) an inflammatory process of the anterior segment of the eye, (2) very pronounced ocular and orbital pain, and (3) rhinorrhea. The anatomy of the nasal nerve is described and the symptoms analyzed. Ocular manifestations of nasal-nerve irritation are keratitis, iritis, pseudopurulent conjunctivitis, and corneal ulcer with or without hypopyon. The principal characteristic of the pain is that it is quite out of proportion to the ocular findings. It may make the patient consider suicide. The pain is characteristically located in the bridge of the nose and radiates to the eye. It suddenly stops on anesthetizing the anterior part of the nasal fossa. The author advises repeated applications of anesthetic solutions to this area, removal of infected foci, treatment of whatever general condition may be found, and sinus therapy. (Bibliography.)

Derrick Vail.

Meyer, J. M., and Okner, H. B. Dysostosis multiplex with special refer-

ence to ocular findings. *Amer. Jour. Ophth.*, 1939, v. 22, July, pp. 713-722.

Mueller, Friedrich. Menotoxins in ophthalmic diseases. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 2, pp. 426-428.

The author quotes Aschner, who believes that many ophthalmic diseases are produced by menotoxins. According to Aschner, substances produced monthly by the female organism to prepare for fecundation of the ovum give rise to catabolic substances that have to be eliminated at the menstrual period. The author believes conservative treatment should be instituted in gynecological conditions, to preserve those organs which play such an important role in maintaining the equilibrium in the female organs.

Ramon Castroviejo.

Mueller, Friedrich. Relations between monocular affections and internal diseases. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 2, pp. 417-418.

Mueller believes that when only one eye is affected in cases of systemic diseases, it must be because the eye is predisposed to disease. He mentions the case of a chemist with albuminuric retinitis in only one eye, which apparently was the one used for microscopic observation. Similar cases are mentioned in glaucomatous patients.

Ramon Castroviejo.

Németh, Lajos. Hypersensitivity reactions of the eye. *Orvosi Hetilap*, 1939, v. 83, May, p. 514.

The author enumerates various ocular diseases in which allergy might be accepted as the etiologic factor. The therapy consists of eliminating the sensitive agent, of desensitization, or of

symptomatic treatment. The author warns against performing any operation during the allergic state.

R. Grunfeld.

Pergola, Alfredo. Oriental button in the prelacrimal region. *Rassegna Ital. d'Ottal.*, 1939, v. 8, Jan.-Feb., p. 33.

The patient described was a forty-year-old soldier who presented a typical oriental button in the skin over the lacrimal sac on the left side. This situation is most rare and various other possibilities were considered, but the bacteriologic study showed the classical parasite of tropical Leishmaniasis. (2 figures.)

Eugene M. Blake.

Potvin. Cholesteremia and its ocular manifestations. *Bull. Soc. Belge d'Ophth.*, 1939, no. 77, p. 160.

Hypercholesteremia can be attributed not to hepatic insufficiency, but rather to a process of defense of the organism against biliary intoxication. On the other hand, in grave infections such as cancer or tuberculosis the percentage of cholesterol is low. There seems to be a constant relation between the gravity of the infection and the amount of cholesteremia. The author presented a study on the metabolism of cholesterol in 1936 (see *Amer. Jour. Ophth.*, 1937, v. 20, p. 866). He states that recent clinical and laboratory observations confirm the corneal manifestations of hypercholesteremia described in that study. Among these manifestations, corneal anesthesia or hypesthesia are not due to intoxication of the ciliary ganglion but to mechanical blocking by deposits of cholesterol at the corneal margin, where the return circulation is slow. One would expect to find the same manifestations in other regions of the eye, such as the

episclera, the iris, and the retina, and wherever the nutrition of the eye is complex and unsettled. The author has observed several cases of typical episcleritis in patients of the neuro-arthritic group. Cholesterol is a vascular toxin and particularly a toxin to the veins. Hence one finds important changes of the retina in cases of chronic cholesteremia, such as capillary and venous thromboses. Alkalosis favors the dissolution, acidosis the precipitation of cholesterol in the serum. It would seem that cholesterol and histamine carried by the blood stream play an extremely early role in the endovascular changes that give rise to sclerosis. (17 references.)

J. B. Thomas.

Van Duyse and Van Canneyt. Results obtained by injection of an emulsion of tubercle bacilli into the retro-ocular cavity of the rabbit. *Bull. Soc. Belge d'Ophth.*, 1938, no. 77, p. 174.

By injecting an emulsion of *treponema pallida* into the retro-ocular cavity of the rabbit, the authors were able to provoke specific manifestations affecting primarily the anterior segment of the eye (especially the cornea), and secondarily the iris and ciliary body. The conjunctiva and deep membranes remained uninjured. These observations led the authors to repeat the experiment, using tubercle bacilli. Human tubercle bacilli in doses of 3 mg. caused granulomas which became necrotic. Bovine tubercle bacilli in doses of 1 mg. provoked lesions of different parts of the globe and its adnexa with the exception of the winking membrane. The infection spread slowly from the retrobulbar tissues, involving all tissues of the globe and finally the lids and skin. (Illustrations.)

J. B. Thomas.

18

HYGIENE, SOCIOLOGY, EDUCATION,
AND HISTORY

Bistis, J. Statistical remarks on blindness in Greece. *Ophthalmologica*, 1939, v. 97, May, p. 90.

In Greece, with a population of 6,500,000, one person per thousand is blind. Of 373 persons practically blind (that is, inability to count fingers at more than one meter), 6.5 percent were blind from trachoma, more than 13 percent from optic atrophy, and 16 percent from glaucoma. F. Herbert Haessler.

Hamilton, J. B., and Councell, W. P. Cause and prevention of blindness in Tasmania. *Med. Jour. Australia*, 1939, v. 1, March 18, pp. 430-433.

This review of blindness in Tasmania is a supplement to a report made eighteen months previously. It analyzes the causes of blindness in Tasmania, and gives several recommendations for reduction of the number of blind individuals. T. E. Sanders.

Harman, N. B. The work of the National Ophthalmic Treatment Board. *Brit. Med. Jour. Supplement*, 1939, Feb. 25, pp. 85-87.

The organization and activities of the National Ophthalmic Treatment Board, which provides a means whereby persons of limited income can obtain proper medical advice and efficient spectacles at a cost within their reach, are reviewed and discussed. (See also editorial, *Amer. Jour. Ophth.*, 1939, v. 22, p. 677.) T. E. Sanders.

Jimenez, J. V. Trachoma in the province of Corrientes and national territory of the Chaco. (A report presented to the National Department of Health

of the Republic of Argentina.) *La Semana Med.*, 1939, v. 46, May 11, pp. 1050-1060.

In Corrientes more than 4.91 percent of the population were found to present actual trachoma or a condition suspected to be trachoma. In the national territory of the Chaco, 12.95 percent were thus classified. W. H. Crisp.

Kirwan, E. O'G. Early ophthalmologists in Calcutta. *Indian Med. Gazette*, 1938, v. 73, July, p. 423. (See *Amer. Jour. Ophth.*, 1938, v. 21, May, p. 601.)

Lebensohn, J. E. Louis Émile Javal, 1839-1907; a centenary tribute. *Arch. of Ophth.*, 1939, v. 21, April, pp. 650-661.

This biography reviews the training and achievements of the French ophthalmologist, whose early interest in optics and orthoptics was stimulated by defects of his father's and sister's eyes. He invented an optometer and clinical ophthalmometer and discovered the character of ocular movements as a by-product of his research in orthoptics. After he became blind from glaucoma, he invented a writing rack and published in vivid detail his observations on his own case of glaucoma. J. Hewitt Judd.

Maggiore, Luigi. In memory of Giuseppe Cirincione. *Ann. di Ottal.*, 1939, v. 67, March, pp. 161-178.

An "in memoriam" ten years after the death of the founder of the journal. He was also Professor of Ophthalmology at the University of Rome, and a close personal friend of Gabriele D'Annunzio. He was subjected to bitter attacks within the profession, and apparently played a losing part in Italian political disputes during the later years of his life.

Manolesco, D. Organization of the struggle against trachoma in Rumania. Bull. Acad. de Méd. de Roumanie, 1939, v. 7, no. 1, p. 42.

An extensive discussion of antitrachomatous activities in Rumania. Methods of treatment and control of the disease in schools, factories, prisons, asylums, hospitals, and army, as well as in family groups, are discussed in detail. George A. Filmer.

Mueller, Friedrich. Constitutional treatment of ophthalmic diseases. Tra-

balhos do Primeiro Cong. Brasileiro de Ophth., 1936, v. 2, pp. 417-418.

The author emphasizes the importance of considering the organism as a whole in treating affections of the eyes, indicating that the eye is but a small part of the whole organism. To add strength to his arguments, he quotes paragraphs from works of Hippocrates and Aschner. Ramon Castroviejo.

Waugh, D. D. Ophthalmological requirements for employment, 1939. Amer. Jour. Ophth., 1939, v. 22, June, pp. 665-667.

NEWS ITEMS

Edited by DR. H. ROMMEL HILDRETH
640 S. Kingshighway, Saint Louis

News items should reach the Editor by the twelfth of the month

DEATHS

Dr. Charles Louis Billard, Washington, D.C., died May 1, 1939, aged 60 years.

Dr. Myron Ellis Kahn, Chicago, Illinois, died May 25, 1939, aged 47 years.

MISCELLANEOUS

The New York Post Graduate Medical School and Hospital (Columbia University) has arranged an informal dinner reunion for former matriculates in the eye seminar, former residents, and members of the hospital staff, to be held on October 10th at the Palmer House, Chicago. Dr. James W. Smith, 1016 Fifth Avenue, New York City, is in charge of reservations.

The establishment of a course in Fundamental Sciences in Ophthalmology at the Har-

vard Medical School as a prerequisite to advanced courses has been found of value not only to the practicing ophthalmologist who feels inadequately prepared in basic fundamentals but it introduces the beginner into ophthalmology in the proper manner so that he is fully aware of the broad scope of ophthalmology and the futility of inadequate preparation. On the basis of the experience of the past two years, since the fundamental course was introduced, the entire schedule for all courses is arranged so that the course in fundamentals can be followed by clinical courses in proper sequence, giving a full academic year of study. This year the fundamental course is given from October 16th to December 23d. It is followed in January by courses in Neuro-ophthalmology and Perimetry and Ocular muscles, the latter being conducted by Dr. Bielschowsky.

A STATEMENT ABOUT QUALITY

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THE OCULAR SHWARTZMAN PHENOMENON*

T. E. SANDERS, M.D.

Saint Louis

In the course of some experimental studies of ocular hypersensitivity, during which bacterial filtrates were injected into the eyes of rabbits, the question of the role played by the Shwartzman phenomenon arose. It was found that the literature on this reaction in the eye was very limited, none of it in English, and the results not conclusive. As the reaction in itself is exceedingly interesting, and as it might have some bearing on some clinical ophthalmic problems, the experimental study here reported was undertaken as a corollary to the larger problem of ocular hypersensitivity.

The Shwartzman phenomenon has been defined, in general terms, as the production of hemorrhage and other vascular damage by means of two injections of a variety of substances with a short interval between them.¹ The phenomenon of local-tissue reactivity or the Shwartzman reaction was first described by that author² in 1928. He found that if a potent bacterial filtrate was injected into the skin of a rabbit no appreciable reaction resulted, the strongest effect being an erythema that promptly subsided. However, if, 24 hours after the local injection, the rabbit was injected intravenously with the same or another potent

filtrate, there appeared after four or five hours an extremely severe hemorrhagic necrosis at the site of the local injection. As repeated subcutaneous or intradermal injections at the same site at various intervals of time produced only a moderate inflammation, it was essential that the second or reacting injection be given intravenously. Sanarelli³ in 1924 had shown that an intravenous injection of *B. coli* culture filtrate, although tolerated by control animals, elicited a fatal hemorrhagic congestion in the intestinal tract of rabbits which had previously received a sublethal dose of *Vibrio cholerae*. As this seems to be a phase of the Shwartzman phenomenon, the reaction in Europe is usually known as the Sanarelli-Shwartzman phenomenon.

Shwartzman⁴ believes that this phenomenon is due to a new category of bacterial exotoxins, as the filtrates by his method are prepared from saline washings of 24-hour agar cultures, which are relatively free from autolytic products. Some bacteria yield a filtrate containing active principles of considerable potency; among them are meningococcus, *B. typhosus*, *B. paratyphosus*, *B. coli*, *B. pestis*, Friedländer's bacillus, *B. dysenteriae*, *B. influenzae*, *B. pertussis*, and *Vibrio cholerae*. Many bacteria produce the principles in low and variable concentration, among these being pneumococci, streptococci, staphylococci, *B. tuberculosis*, *B. melitensis*, and the *Spirochaeta pallida*.⁵

Their potency varies with different

* From the Department of Ophthalmology and the Oscar Johnson Institute of the Washington University Medical School. Part of a study being conducted under a grant from the John and Mary R. Markle Foundation. Read before the Association for Research in Ophthalmology in Saint Louis, May 16, 1939.

strains of the same organism, and a strain may yield toxins of varying potency. Filtrates may partially or completely lose their potency on aging. They are filterable, heat resistant, and may be accurately titrated. The filtrates may be concentrated by dialysis or ammonium-sulphate precipitation, and the dried material retains its potency.⁶

Rabbits differ in their degree of susceptibility, about 20 percent being highly refractive to typhoid filtrates. The reaction can also be produced in goats, guinea pigs, and horses, but has never been induced in rats or mice. The preparatory and reacting factors may be different, but both are antigenic and may be neutralized by immune sera. Active immunity can be produced by injection of the filtrates, and it is possible to confer passive immunity by injecting the immune sera intravenously one-half hour before the intravenous injection of the reacting principles.⁷

Although it is essential that the provocative injection be given into the blood stream, the preparatory factors may be introduced in several different ways. By a direct injection into the parenchyma of an organ, the phenomenon has been produced in a number of different tissues and organs; knee joints (Moritz and Morley⁸), stomach (Karsner, Ecker and Jackson⁹), appendix (Latter¹⁰), kidney (Loi and Cardia¹¹), adrenal (Grouchi¹²), pancreas (Reitano and Loi¹³), spleen (Patania¹⁴), and the liposarcoma of guinea pigs (Gratia and Linz¹⁵). In the lung it has been produced by the intratracheal administration of the preparatory factors.¹⁶

The phenomenon can also be produced by way of the local vascular supply, as the reaction can be elicited in the kidney by injection of the preparatory factors into the renal artery.¹⁷ It can also be elicited in the lymph nodes either with prepara-

tion by direct injection into the lymphatic vessels,¹⁸ or by lymphatic drainage from an area of cutaneous injection.¹⁹

It has been shown that the state of reactivity can also be produced by way of the general circulation; for, if two intravenous injections of an active filtrate are made 24 hours apart, lesions characteristic of the phenomenon are found in the kidneys.^{20, 21} The localization in the kidneys is thought to be due to the extreme permeability of the renal capillaries with passage of the preparatory factor into the kidney tissue. A generalized Schwartzman reaction has also been described, resulting in death of the animal, after two intravenous injections.²²

As far as could be found, there are only five papers in the literature dealing with the Schwartzman phenomenon as occurring in the eye or adnexa; namely, those of Cassuto (1933²³), Mossa (1935²⁴), Rossi (1935²⁵), Fabiani and Gauthier (1937²⁶), and Mikaelyan and Aronov (1938²⁷). As to its occurrence in the bulbar conjunctiva, the reaction was found to be consistently positive, with characteristic histological findings, in 89 percent by Cassuto, in 75 percent by Mossa, and in the majority of cases by Mikaelyan and Aronov. Mossa found that in the anterior chamber the reaction was positive in 88 percent of the cases, with histological changes in the iris and ciliary body consisting of minute hemorrhagic foci, edema, and infiltration with polymorphonuclear leucocytes. On the other hand, Mikaelyan and Aronov were unable to elicit the phenomenon in either the anterior chamber or the vitreous. The results of Cassuto as to the occurrence of the phenomenon in the anterior chamber were inconclusive. The reaction in the cornea has been shown to be consistently negative.^{24, 27, 28} Fabiani and Gauthier demonstrated this to be due to the lack of capillaries in the cornea, hav-

ing produced vascularization of the cornea by means of corneal ulcers and then elicited a positive reaction in the vascularized cornea.

Excellent histological studies of the phenomenon have been made by Karsner and Moritz²⁸ and Gerber.²⁰ The former state that "The preliminary injection of filtrates used in the Schwartzman reaction leads to exudative inflammation, which, although of variable degree, is usually slight or mild. Following the subsequent intravenous injection of the filtrates, the inflammation becomes much more severe, and is accompanied by vascular thrombosis, vascular necrosis, and hemorrhage. The exudate is in large part inflammatory edema and at the height of the reaction the cells are chiefly polymorphonuclear leucocytes. Eosinophiles are not found at any time. The process heals by granulation, organization and cicatrization." They believe that the difference between the preparatory reaction and the final reaction is quantitative rather than qualitative. Gerber states that the inflammation caused by the preparatory injection is nonspecific and bears no relation to the preparedness of the skin for the phenomenon. He found that the earliest changes, which follow the injection of the reacting factors, are extensive capillary and venous dilatation and congestion, hemorrhage, and vascular thrombosis, the hemorrhage preceding the thrombosis. Concurrently there is an accentuation of the preëxisting inflammation. He believes that the cause of the hemorrhage is not definite, but probably results from diapedesis, for the hemorrhage is present before actual vascular rupture. The thrombosis is due to a slowing of the circulation, extensive perivascular inflammation, and a change in endothelial activity. The necrosis is due to both or the primary effect of the toxins and to the resultant disturbances

of circulation. The organization of the thrombosis is caused by a proliferation of the endothelium. Although Karsner and Moritz believe that the Schwartzman phenomenon belongs somewhere in the category of immune processes, in their opinion the increased severity of the reaction which follows the intravenous injection is probably due to the concentration of the injurious agent at the site of the inflammation determined by the preparatory local injection, the local inflammatory reaction being necessary for the production of the phenomenon.

Shwartzman³⁰ has shown that the phenomenon is not anaphylactic in nature and that it can be sharply differentiated from the Arthus phenomenon, and also from the various phenomena of bacterial allergy by the following points: 1. The incubation period is of extremely short duration. 2. The reactivity disappears completely in 48 hours. 3. The reactivity is induced by a single injection. 4. The reaction is severe and appears rapidly. 5. The second injection must be by the intravenous route. 6. The phenomenon cannot be reproduced by nonbacterial substances as egg white and horse serum. 7. The factors responsible for the phenomenon are only found in certain bacterial cultures, and they vary in potency. 8. The factors of various organisms can be substituted for each other. 9. No passive transfer of the phenomenon can be obtained. 10. The factors are neutralized specifically by immune sera. Shwartzman⁴ gives the following explanation of the mechanism. "The skin of a rabbit is spontaneously resistant to the effect of the category of the toxins under consideration. Exposure to them induces a state of vulnerability of a short duration, during which the tissue sustains severe injury from toxins present in the blood stream at that time. Thus, in contrast to true exotoxins which have a primary effect upon tissues, this

category of toxins elicits injury via the blood stream in tissues of induced vulnerability."

EXPERIMENTAL METHODS AND RESULTS

The Shwartzman phenomenon was studied in the eyes of 58 rabbits, a typhoid

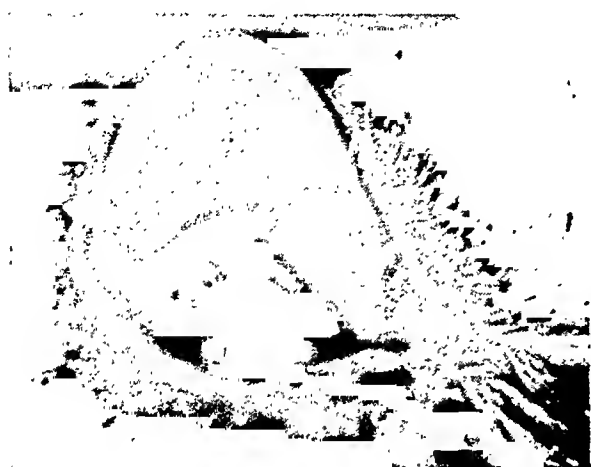


Fig. 1 (Sanders). The right eye of a rabbit 24 hours after the subconjunctival injection of the preparatory filtrate, showing the average moderate primary reaction.

filtrate being used which was prepared as described by Shwartzman.² Veal-infusion broth, pH 7.4, was inoculated with a stock laboratory culture of *B. typhosus*, and after it had been incubated for 22 to 24 hours, 2 to 3 c.c. was poured on the surface of plain beef extract agar, pH 7.4, in Kollé flasks. After 20 to 24 hours' incubation, the growth of each flask was washed with 3 to 4 c.c. of 0.9 percent NaCl solution containing 0.4 percent phenol. The washings were pooled, centrifuged, and the supernatant fluid was filtered through a Berkefeld V filter. Before being used for the ocular reaction, each lot of filtrate was tested for potency by its ability to produce the phenomenon in the rabbit skin. The various lots of filtrates varied considerably, not only in the ability to produce the phenomenon but also in the amount of inflammatory reaction produced in the

anterior chamber by the preparatory dose alone. Using this filtrate, attempts were made to reproduce the reaction by injection into the conjunctiva, anterior chamber, and vitreous, followed in 24 hours by intravenous injection of the same filtrate. Two of the animals died following the intravenous injection.

Seventeen rabbits were tested in the skin, conjunctiva, and anterior chamber, a commercial gonococcus filtrate of Corbus-Ferry²¹ being used (supplied by Parke-Davis and Co.). Since none of these reaction were positive, it was assumed that this filtrate does not contain the factors responsible for the Shwartzman phenomenon.

Conjunctiva. In the 14 rabbits used to study the reaction in the conjunctiva, the preparatory dose consisted of 0.2 to 0.3 c.c. of the filtrate injected subconjunctivally over the insertion of the superior-



Fig. 2 (Sanders). The same eye as in figure 1, 24 hours later, after the intravenous injection, showing an inflammatory edema and a large hemorrhagic chemosis.

rectus tendon. In 24 hours, at the site of the injection, a reaction was noted in all animals which varied from an almost imperceptible change to one consisting of quite marked inflammation and a rare petechial hemorrhage. In most cases the

Fig. 3 (Sanders). Section showing a positive conjunctival reaction, with marked inflammatory edema, massive subconjunctival hemorrhages, and vascular dilatation.



Fig. 4 (Sanders). Section through the conjunctiva of a control animal, 48 hours after the primary injection, showing a moderate inflammation with some scattered red cells.

reaction was moderate, consisting chiefly of edema and mild inflammation of the subconjunctival tissues, with some superficial congestion extending from the area

of injection back into the superior fornix (fig. 1). At this time 12 of the animals were injected with 2.5 c.c. of the same filtrate into the marginal ear vein, two

being retained as controls. Within another 24 hours the reaction in the control animals had begun to recede, while in 10 of the remaining 12 animals it was definitely positive; that is, in 84 per cent. The negative reactions showed no changes, resembling the controls, while the 12 positive animals showed marked

hemorrhagic chemosis. In comparison, figure 1 shows the same eye 24 hours before, at the time of the intravenous injection.

Histologically, the conjunctival positive reaction was very similar to that described as occurring in the skin. Although the epithelial cells were swollen, the chief



Fig. 5 (Sanders). Section showing an inflammatory and hemorrhagic reaction surrounding the retinal vessels of a rabbit which had had an intravitreal injection of filtrate 48 hours before, followed in 24 hours by an intravenous injection of the same filtrate.

conjunctival reactions. In the area of injection there was a very marked inflammatory edema with much congestion. This was associated with areas of subconjunctival hemorrhage, which in a few animals was so marked as to give the appearance of a large ecchymosis. In the marked reactions the edema was sufficient to give rise to a definite chemosis, which caused a definite fullness of the lid. When the conjunctiva was dissected free, the hemorrhagic reaction grossly extended back into the tissues of the orbit along the superior-rectus muscle. In several animals there was a clouding of the adjacent cornea. Figure 2 shows a marked positive reaction in the right eye of a rabbit, presenting an inflammatory edema and a large subconjunctival

changes were in the underlying tissues, consisting of a diffuse inflammatory edema with a cellular infiltration chiefly polymorphonuclear, although an occasional mononuclear was present. The amount of hemorrhage was extreme, although it varied in different areas from large masses of extravasated blood to scattered red cells. The smaller vessels were dilated and many appeared to be thrombosed, as were some of the larger veins (fig. 3). In the controls there was much less edema, the most marked change being a polymorphonuclear infiltration. Although there were no massive hemorrhages, there were many scattered red cells throughout the subepithelial tissues, with a few well-defined foci. There was some dilatation of the smaller vessels,

but no thrombi were noted (fig. 4).

Vitreous. The reaction as occurring in the vitreous was studied in 19 eyes, in 8 animals the filtrate being injected into the vitreous of the left eye and the anterior chamber of the right, and in 11 others the vitreous only being injected. The preparatory injection, consisting of 0.1 c.c. of the typhoid filtrate, was in-

as controls. In 24 hours, the appearance of the injected eyes of the controls showed very little change, while the changes noted in the injected eyes of the intravenously treated animals were variable and indefinite. Although there seemed to be a slight increase in the degree of the reaction in 8 of the 14 animals, shown by an increase in the amount of exudate and

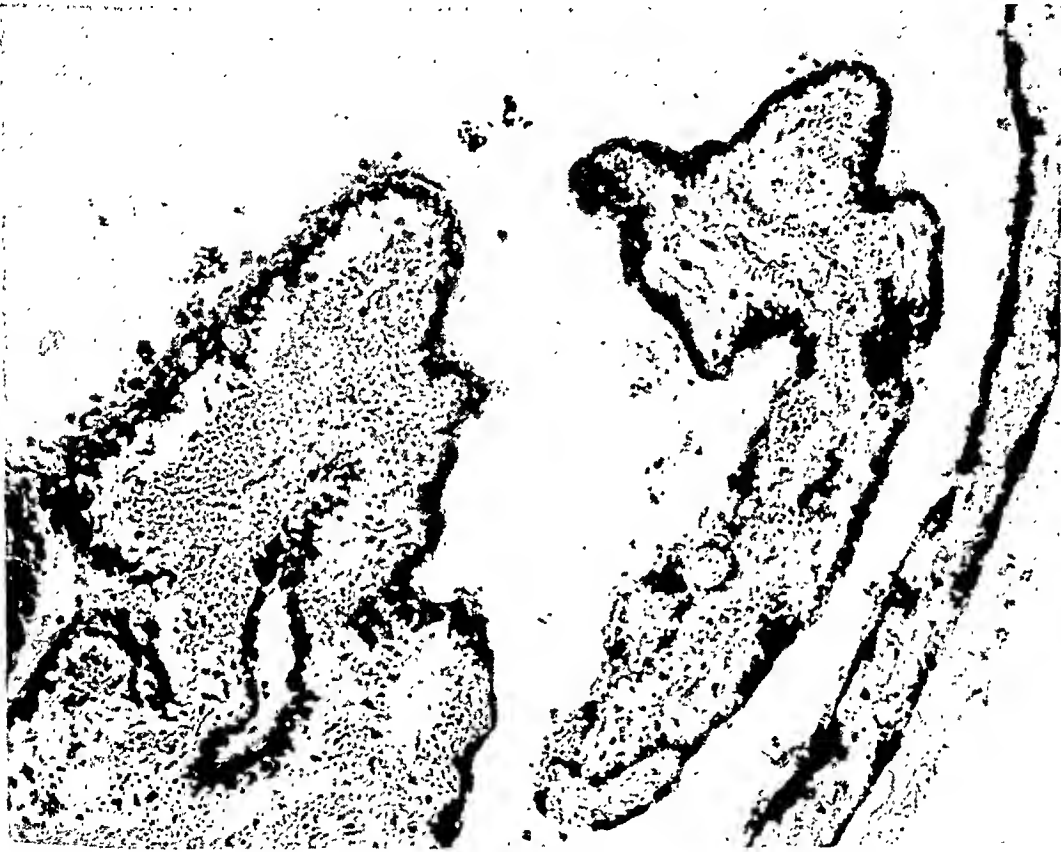


Fig. 6 (Sanders). Section through the ciliary processes of a rabbit which had had an intravitreal injection of filtrate 48 hours before, followed in 24 hours by an intravenous injection, showing edema and congestion of the processes with some extravasation of blood.

jected into the vitreous through the upper temporal quadrant of the globe about at the equator.

After 24 hours the eyes showed varying degrees of inflammatory reaction, there usually being some circumcorneal injection, hazy aqueous with muddy iris, and, in the majority of the animals, varying amounts of exudate in the anterior chamber. At this time 2.5 c.c. of the filtrate was injected into the marginal ear vein of 14 animals, 5 being retained

the degree of injection present, this was not definite enough quantitatively to be regarded in any of the animals as a positive reaction. No hemorrhages were noted except in the iris of one of the intravenously injected animals and in one of the controls.

Histologically, the significant changes were limited to the posterior segment, but were not so marked as was suggested by the amount of gross reaction present. In every case there was an inflammatory

exudate in the vitreous composed almost wholly of polymorphonuclears, and varying from a few scattered cells to well-defined foci. Scattered over the surface of the retina were clumps of red blood cells and leucocytes, chiefly polymorphonuclears with an occasional mononuclear. This reaction was, as a rule, perivascular, and was usually particularly marked in the region of the papilla (fig. 5). The iris and ciliary body were edematous, and in the ciliary processes the vessels were dilated with occasional extravasations of red cells (fig. 6). There were usually a few leucocytes in the anterior chamber, particularly in the angle. No evidence of vascular damage was noted in any section. In the control group, the reaction was quite similar to, but definitely less in degree than that of the intravenously injected animals, and seemed to differ quantitatively only. The amount of reaction varied considerably in the individual specimens in both control and experimental groups. Because of the quantitative nature of the reaction and the individual variation, the histological difference was not clear-cut enough to determine accurately the percentage of positive reactions. However, there was, in general, enough quantitative difference between the experimental and control groups to justify the conclusion that the phenomenon does occur if the preparatory factors are injected into the vitreous.

Anterior chamber. This series consisted of 24 eyes, the 8 right eyes of the previous group, and those of 16 animals injected in the anterior chamber alone. A 29-gauge needle was passed through the cornea about 2 mm. inside of the superior limbus, and one or two drops of aqueous were allowed to escape. This was replaced with 0.1 to 0.2 c.c. of the typhoid filtrate in 4 of the animals. In the remaining 12, dilutions of 1:1, 1:5, and 1:10 were used, in groups of four animals for each dilu-

tion, in an attempt to reduce the amount of the primary reaction. The usual intravenous injection of 2.5 c.c. was given in 24 hours, six animals being used as controls.

The primary local reaction due to the initial injection varied markedly; in general, the amount of reaction paralleled the strength of the dilutions. In about half of the eyes there was no reaction whatsoever, while in the remaining eyes the reaction consisted of moderate circumcorneal injection, slight clouding of the anterior chamber, with some haziness in the iris, and varying amounts of exudate, a few being so great as almost to fill the anterior chamber. Following the intravenous injection, none of the animals without a primary reaction showed any change; in the animals with reactions, there was enough gross difference quantitatively in only three to suggest a positive reaction.

Histologically, the findings were limited to the anterior segment, except for a few polymorphonuclears in the vitreous. In the majority of specimens the amount of histologic change was surprisingly slight: even in the eyes that showed large amounts of gross exudate was there, in the anterior chamber, only a moderate amount of albuminous fluid with scattered pus cells, while in those specimens without reactions, the changes were limited to a few polymorphonuclears in the angle. There was usually some edema of the iris and ciliary body, less in degree than that seen in the previous group. None of these specimens could be called positive, in as much as about the same findings were present in the controls.

COMMENT

In the present study, the observations of the previously quoted investigators with regard to the occurrence of the phenomenon in the conjunctiva are con-

firmed as to the approximate percentage of results, the gross appearance, and the histologic findings. However, it must be emphasized that in the controls the same histologic changes were present, even though to a much less degree. It is possible that the definite reaction induced by the preparatory factors was the cause of the marked effect of the reacting factors, which, although very definite, seems to be quantitative, such changes as thrombosis being due to massive effect. These observations are in accord with the views of Karsner and Moritz rather than with those of Gerber.

This fact is even more evident in the reaction to the intraocular injections. The findings of edema of the iris and ciliary body, dilatation of the vessels of the ciliary processes with some extravasation of blood and perivascular hemorrhage and exudate over the retina, are the histological findings to be expected intraocularly in any vascular damaging reaction such as the Schwartzman phenomenon, but these same changes are seen to a lesser extent in the controls. These findings again suggest a quantitative reaction, the margin between the positive reaction and the control in this case being so small as to make the results inconclusive.

From the amount of gross reaction present, the small degree of histological change found is surprising, for it would be expected that the reaction to the preparatory injection would be more marked intraocularly than in the skin or conjunctiva. This is probably due to the marked dilution the preparatory injection undergoes when injected into the aqueous or vitreous. The difference in the severity of reaction in the anterior chamber and in the vitreous is probably due to the leakage through the site of corneal injection, plus more rapid loss of the filtrate through the normal drainage channels of the anterior chamber. When diffused

throughout the intraocular tissues, the concentration of the preparatory factors is not great enough to excite the vulnerability of the tissues sufficiently for the production of a clear-cut positive Schwartzman phenomenon, but is great enough to induce a definite cellular reaction. The amount of filtrate necessary to effect a positive reaction, unless highly potent, would probably cause such a marked primary reaction that the effect of the intravenous injection would be difficult to interpret.

These facts aid in explaining the lack of uniformity of the results of the ocular Schwartzman reaction as reported in the literature. The results of the present study seem indeterminate, as were those of Cassuto, but they could easily be interpreted as negative, as were the findings of Mikaelyan and Aronov. It is possible to see how such findings as reported by Mossa could be obtained with a highly potent filtrate.

Although it is always dangerous to draw hypothetical comparisons between experimental laboratory reactions and clinical disease, the mechanism and lesions of this phenomenon suggest two general applications in ophthalmology; namely, first, a process by which a focus of infection may act; and second, an explanation of some phases of the foreign-protein reaction. These suggestions are not advanced as actual theories, based on the findings of the present experimental work, but merely as hypothetical possibilities which might be explained by the mechanism of the Schwartzman phenomenon.

In the first place, in addition to direct action of a toxin, metastatic infection, and bacterial hypersensitivity, this phenomenon must be considered as one of the means by which a focus of infection can cause activity in a distant lesion. As in this phenomenon the reactivity of a local inflammatory lesion is caused by a cir-

culating toxin, it seems clear that by absorption of bacterial toxin from a distant focus of infection, the continued activity of an ocular lesion, if not the initial inflammation, might be caused by the Shwartzman phenomenon. This would be particularly true in a highly vascularized tissue such as the uvea, in which a supply of the toxin would be continually available and might keep the lesion active. If the circulating dose were quite massive with sudden onset, a definite hemorrhagic lesion might occur. Theoretically this could produce a marked vitreous hemorrhage, and it seems possible that this might be the mechanism of such clinical lesions as are seen in Eales's disease. If the onset were less in degree and more gradual, a predominantly inflammatory lesion might result, so that it is possible that the continued activity of some cases of uveitis could be on this basis.

It has been shown that the relation between the amount of both preparatory factor and reacting factor is quantitative, for, if the number of local sites is increased or the amount of circulating factor is decreased, no reaction takes place.³² This is due to the fact that the local lesion fixes the circulating filtrates, so that the amount available for any single site is below its reacting level. This suggests the possibility of treating any condition that could be caused by this phenomenon by local subcutaneous injection of an active filtrate that would fix the circulatory factors, and thus prevent them from acting on the local lesion. It would be essential that only a small amount be injected so that an excess would not cause an increase in the circulating toxins by absorption.

Second, the phenomenon can be used to explain several phases of the foreign-protein reaction. Although the benefit caused by foreign-protein therapy is believed to be due to a number of different factors,

such as leucocytosis and mobilization of antibodies, one of these factors seems definitely to be an increase in the capillary permeability at the site of the lesion.³³ Although the massive intravenous doses used in the experimental Shwartzman phenomenon caused marked vascular damage, it is possible that the slightest degree of change caused by small doses might give rise to an increased capillary permeability, the local lesion acting as the prepared site. This could very well be one of the effects of intravenous typhoid vaccine.

The mechanism of this reaction can be used to explain not only the therapeutic effect but also some complications of foreign-protein therapy. If the local lesion were particularly susceptible, or, if the therapeutic injection were particularly potent, one might expect a more marked Shwartzman effect with a temporary exacerbation of the local lesion. This would seem to be a satisfactory explanation of a well-known complication of foreign-protein therapy, the focal reaction, which consists of a temporary flare-up in the local lesion after a therapeutic injection of foreign protein.³⁴ In a similar manner, an injection of foreign protein may cause activity in a previously quiet focus, independent of the lesion under treatment. An excellent example of this is in the report of Hench,³⁵ who found that among 2,500 patients given 10,000 injections of intravenous typhoid vaccine at the Mayo Clinic, there was an untoward reaction in 14, consisting of appendicitis, subacute cholecystitis, acute pleurisy, iritis, glaucoma, and marked vascular thrombosis. He quotes from the literature 4 cases of marked vascular thrombosis and 11 cases of death from hemorrhage, usually intestinal, following intravenous injection of typhoid vaccine. As in each case a previously quiet lesion was activated with evidence of vascular damage

by the intravenous injection of typhoid vaccine, the Shwartzman phenomenon could very well be the mechanism of these previously unexplained complications.

In conclusion, the results of the present report would seem to indicate that the Shwartzman phenomenon is fundamentally a quantitative one; that the phenomenon can be reproduced in the conjunctiva with a high degree of regularity with histologic

findings similar to those in the skin; that the present results are indeterminate for the intraocular phenomenon, but suggest that the reaction in the eye does occur; that the phenomenon could be a mechanism in the etiologic role of foci of infection in the production of ocular disease; and that the phenomenon may explain certain phases of the foreign-protein reaction.

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DISCUSSION

DR. A. ROTH (Chicago, Ill.): Did you try to produce the Shwartzman reaction on vascularized cornea? After provoking vascularization by cautery I could produce the typical reaction. Filtrate of colon bacilli was used. I assume that the capillaries are damaged by the toxin of the preparatory injection.

DR. T. E. SANDERS: I did not include the one or two cases in which I experimented with the cornea because I wanted to have a few more eyes to study before I reported them. In my cases, where I did try the intracorneal injection, vascularization was produced by the use of *Bacillus monocytobenes* with which Dr. Julian-elle has been working. The chief differential characteristic of this organism is that, if instilled in the eye, it sets up a marked pannus and keratitis. I tried the phenomenon in the cornea of one or two of these animals, but did it before the

marked keratitis produced by the organism had disappeared, so that the cornea was soft and not normal. I did not get the typical reaction, probably because of the marked inflammation caused by the infection. I will try more of these reactions in the cornea that has been allowed to heal a little more, and has only the vessels without the inflammatory reaction.

DR. SANFORD H. GIFFORD (Chicago, Ill.): Has the Shwartzman phenomenon been elicited by filtrates of tubercle bacilli? Can it be responsible for some focal reactions to tuberculin?

DR. T. E. SANDERS: The tubercle bacillus is one of the organisms that has a less potent filtrate, and most of the experimental work has been done with *B. coli*, typhoid, and meningococcus. However, there is some evidence that the phenomenon could be a factor in the production of a tuberculin focal reaction.

STUDIES ON SURFACE-EPITHELIUM INVASION OF THE ANTERIOR SEGMENT OF THE EYE*

T. L. TERRY, M.D., J. F. CHISHOLM, JR., M.D.

Boston

AND

A. L. SCHONBERG, M.D.

Cleveland

The presence of extraneous epithelium within the anterior segment of the eye has long been recognized. Complete reference to the early literature is to be found in the recent paper of Perera.¹ Each operative or perforating wound of the anterior segment of the eye presents an opportunity for epithelial invasion to occur. Since epithelization is so infrequent, certain necessary factors in addition to the perforation must be present. Corrado² was able to produce epithelization experimentally by maintaining a subnormal pressure by means of incarcerating iris, lens material, or a celluloid plaque in the wound after implanting the epithelium. He considered a gaping wound and hypotony to be essential. Vail³ and Perera agree on the importance of these factors, while Suzuki⁴ believes that a blood supply to the epithelium is also necessary. Suzuki's operation that produced epithelization in rabbits, fulfilled these conditions at least temporarily.

Approximately 45,500 consecutive cases of perforating wounds** into the anterior chamber of the eye have been seen at the Massachusetts Eye and Ear Infirmary since 1900. During this time only 28 speci-

mens of epithelization of the anterior or posterior chamber were sent to the laboratory. Extraneous epithelial invasion of the interior of the eye is then quite infrequent, occurring in .06 of 1 percent or in one out of 1,625 perforating wounds.† It is evident then that one ophthalmologist, during a long and active practice, would have the opportunity to study a very small number of cases, and would not know the clinical features of the disease as well as conditions more frequently observed.

CASE REPORTS‡ (see figure 2)

Cases following Cataract Extraction

Case 1. Path. No. 5,010. The right eye of a 66-year-old man was enucleated in April, 1922, because of an atheromatous cornea and glaucoma. An intracapsular extraction had been performed two years

† Six of the eye specimens were sent to the laboratory from some other hospital. More recently at least some cases have been treated with X ray, and pathological specimens were not obtained. It is evident that the frequency given on the statistics may be quite inaccurate. However, we believe that the error would not be great enough to increase the frequency over 50 percent. That would give the corrected frequency only .09 of 1 percent.

There were 109 eye specimens of sympathetic uveitis collected in the laboratory during the same period. The rarity of epithelization is even more impressive. These figures give only a general ratio because eyes with sympathetic uveitis might have been removed more readily and more frequently sent to the laboratory for study.

‡ To conduct a comprehensive study, including all essential information, was impossible. In some cases, records were incomplete and in others the pathological material had deteriorated or had become exhausted.

* From the Pathology Laboratory of the Massachusetts Eye and Ear Infirmary, Boston, Massachusetts. Presented before the Association for Research in Ophthalmology in Saint Louis, May 16, 1939.

** This includes operative wounds as well as accidental. Because an epithelial implant was found under the conjunctival flap (fig. 1), glaucoma operations were included. Trephining operations since 1920 represent some 5 percent of the wounds. Some observers might prefer to omit trephining from the frequency study.

previously that was followed by recurring iritis and a blocked pupil.

On pathological examination, epithelium was found lining the shallow anterior chamber.

Case 2. Path. No. 10,582. In 1936, a dislocated lens was removed intracapsularly from the glaucomatous right eye of a 15-year-old boy. Three months later,

Case 3. Path. No. 10,883. In 1937, following an intracapsular cataract extraction on the right eye of a 64-year-old woman, epithelium invading the anterior chamber was diagnosed clinically. X-ray treatment was given, but the exact amount of treatment could not be ascertained. The patient consulted Dr. Fred N. J. Dubé, of Manchester, New Hampshire,

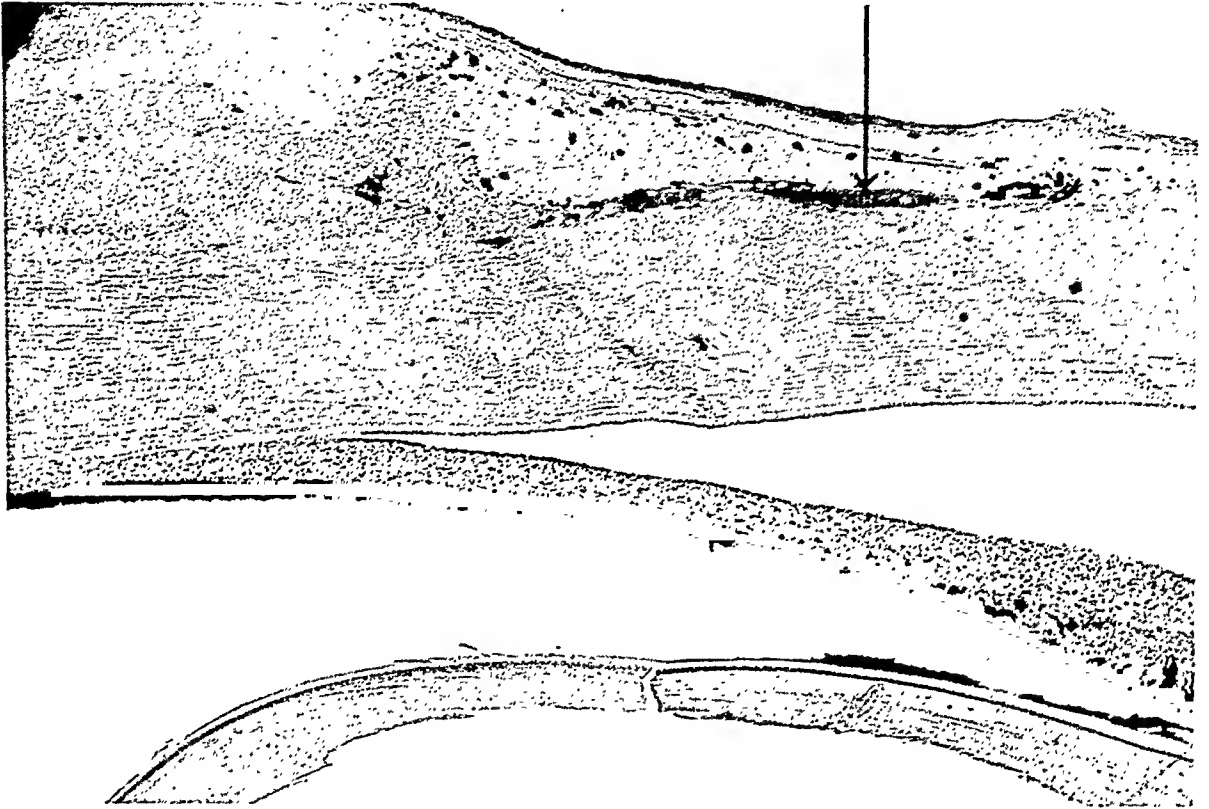


Fig. 1 (Terry, Chisholm, and Schonberg). A small plaque of epithelium was found implanted under the conjunctival flap following a trephining operation (see arrow). It was introduced here probably as an accidental free graft during or after the dissection of the flap. Epithelium can no doubt extend into the eye through a wound from such a source.

the eye, showing a high tension, inflammation, bound down pupil, and edema (sic) of the cornea, was enucleated.

Pathological examination revealed a most extensive growth of epithelium over both anterior and posterior surfaces of the iris, producing a slight entropion uveae. The epithelium continued posteriorly over the ciliary processes where numerous goblet cells were present. On one side the cells even extended onto the vitreous for a short distance.

eight months after the cataract extraction because of intense pain from an intractable glaucoma. The eye was enucleated.

Epithelium was found extending for several millimeters over the posterior surface of the cornea to end in an organized exudate. From the angle the epithelium grew posteriorly, enclosing the stump of iris and the corona ciliaris for a short distance.

Case 4. Path. No. 9,553. In 1923, a

cataract extraction was performed on the right eye of a 67-year-old woman. Glaucoma developed that necessitated two decompression operations. In February, 1934, a flat anterior chamber was observed. Because of pain and lacrimation, the eye was enucleated by Dr. H. B. C. Riemer.

Epithelium was found almost completely lining the anterior chamber. However, it extended only into the false angle already blocked by a synechia. Within the incomplete epithelial cyst was a clump of partially disintegrated cells containing considerable pigment. The cells, probably inflammatory in origin, appeared to have been surrounded by the epithelization.

Case 5. Path. No. 10,740. On December 7, 1935, a 73-year-old woman had an attempted intracapsular extraction performed on her right eye. Two years later the blind, hard, painful eye was removed.

The epithelium extended from the wound, over the filtration angle, to the anterior surface of the iris, and upon the incomplete pupillary membrane. Some epithelium was found extending into the posterior chamber. The epithelium involved the iris angle on the side opposite the operative wound and was present on the back of the cornea for only a short distance.

Case 6. Path. No. 11,024. The left eye of a 72-year-old woman was enucleated in November, 1938, for a persistent glaucoma with bullous keratitis and prolapse of the ciliary body. In 1931, a cataract extraction had been performed, but glaucoma developed for which an unsuccessful trephining was performed in November of the same year.

Examination showed a satisfactory bleb at the site of the trephining. There was an epithelial cyst in the angle (operative coloboma), the walls of which were somewhat compressed. The cyst contained amorphous acidophilic material

of a cholesteatomatous nature,* and some disintegrated pigment. There was a broad anterior synechia below.

Case 7. Path. No. 4,106. The right eye of a 52-year-old man was enucleated in February, 1921, by the late Dr. Derrick Vail, Sr., because of extreme photophobia and the recurrence of a cyst in the anterior chamber. In January, three years previously, a combined extraction had been done. Convalescence, otherwise uneventful, was complicated by a rupture of the wound five days after operation. Vision of 20/20 was obtained. However, in April, 1920, following recurrent attacks of pain and increased tension (22 mm. Hg, Souter), a multilocular cyst was found in the anterior chamber occupying the outer half and extending down behind the iris. Two thirds of the cyst was removed at operation. The cyst recurred.

The pathological examination of the enucleated eye revealed a large multilocular epithelial cyst in the anterior chamber. The iris angle was closed, not by the cyst, but by a synechia on one side and a sclerosed ligament on the other. The cyst partly involved the posterior chamber also. The epithelium was most healthy on the back of the cornea. The cyst was filled with cholesteatomatous material and some exfoliated cells. Some of the iris was atrophic and the epithelium on it appeared irregular and unhealthy.

Cases following Linear Extraction

Case 8. Path. No. 10,017. In 1936, a phthisical right eye was removed from a 13-year-old boy. This eye had sustained a perforating injury. The boy had bilateral interstitial keratitis with a com-

* The term cholesteatomata, used frequently throughout this paper, actually refers to pseudo-cholesteatomata. There is no intention to connect this with a true cholesteatoma, a teratomatous neoplasm usually found in the brain.

plicated cataract. The phthisis bulbi followed a linear cataract extraction.

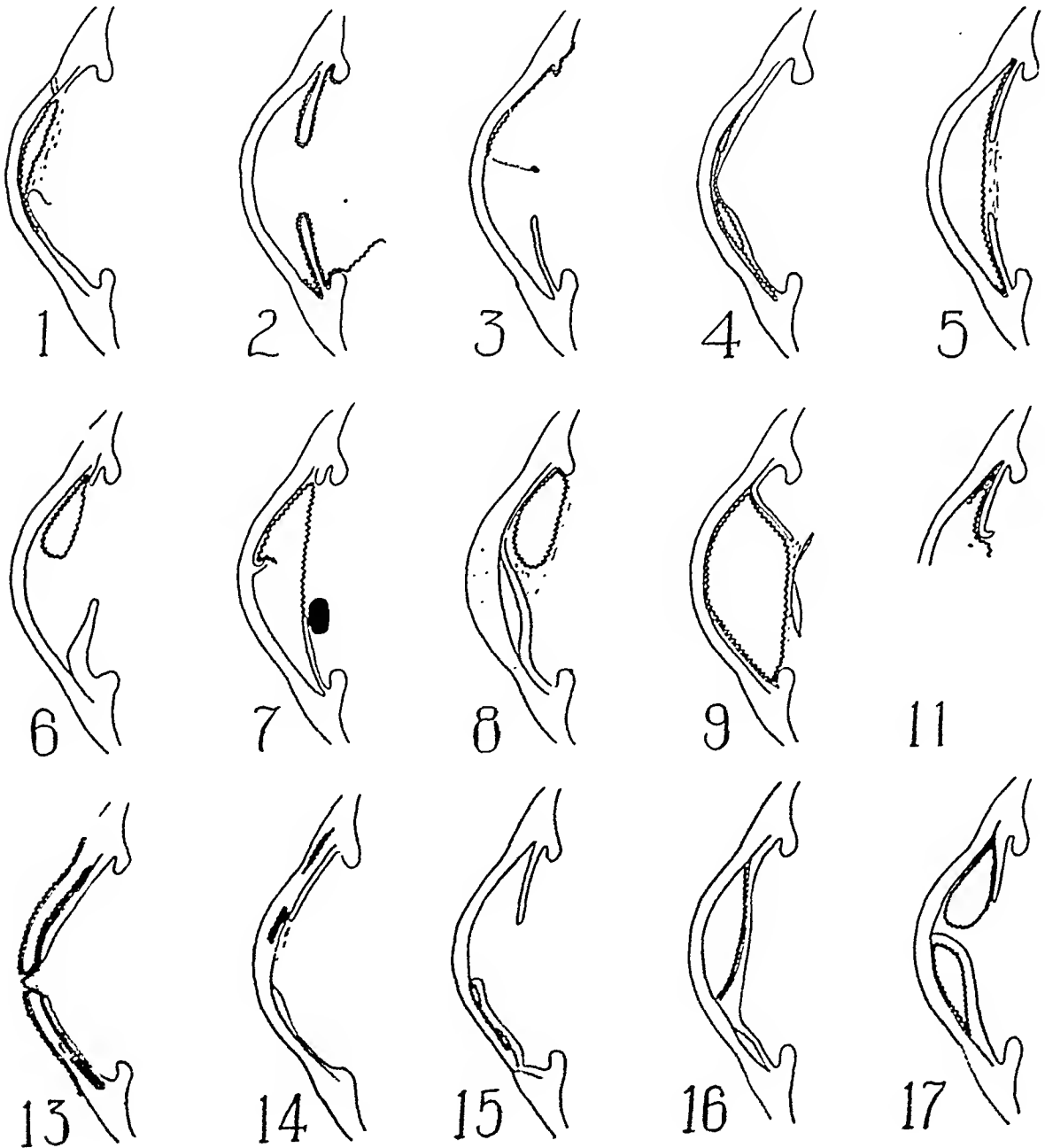
A small epithelial cyst was found in the distorted remains of the posterior chamber. It was attached in part to a cyclitic membrane.

Case 9. Path. No. 8,709. In May, 1931, the right eye of an 11-year-old boy was removed because of recurring iris cysts. In March, 1930, a traumatic cataract (from a nonpenetrating blow) was re-

moved by linear extraction. A discission was performed in July. The iris cyst was observed in November of the same year, at which time an attempt was made to remove it completely.

Broad peripheral anterior synechiae were found. Epithelization involved the posterior chamber. The epithelium extended onto the anterior surface of the secondary cataract.

Case 10. Path. No. 8,693. In December,



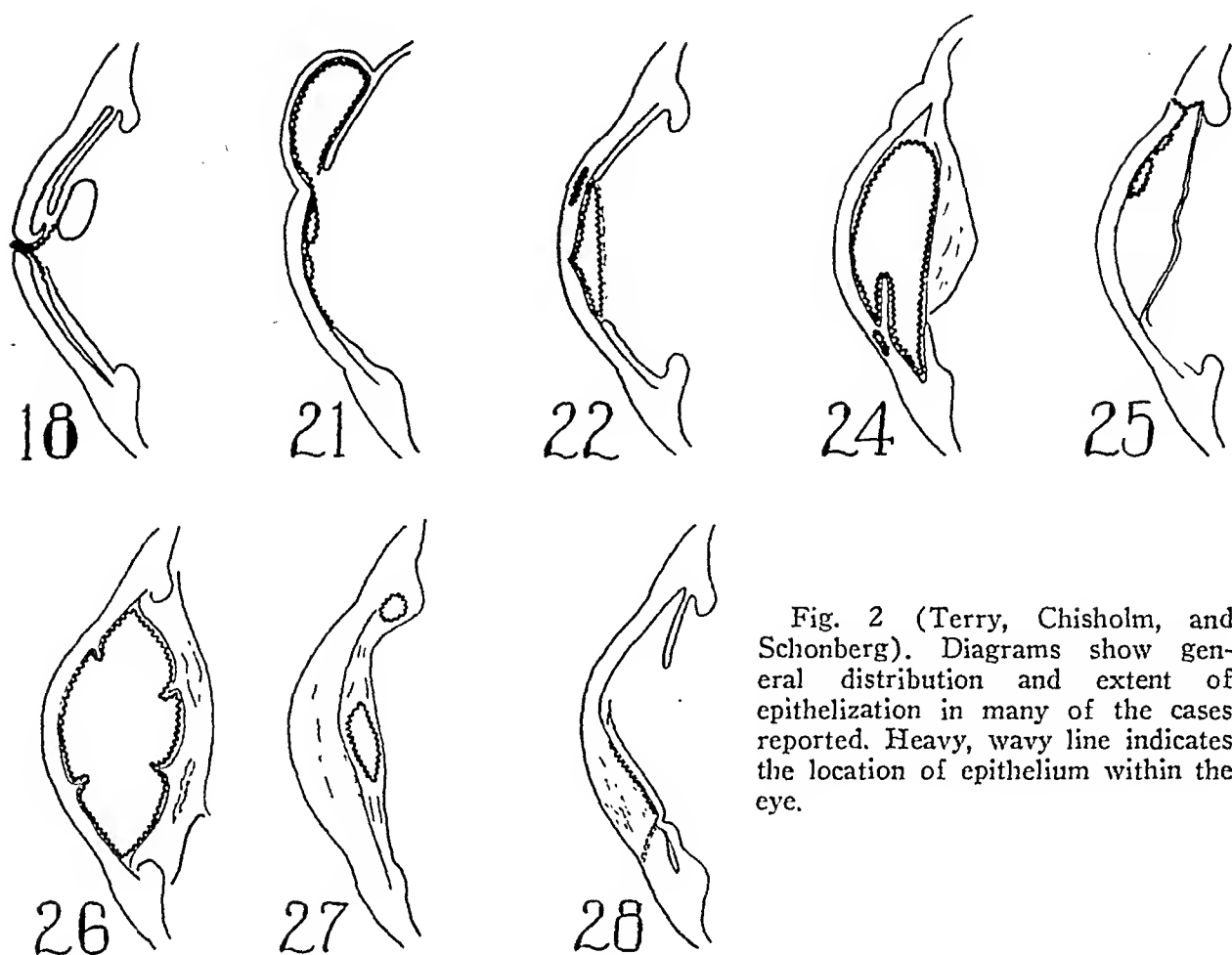


Fig. 2 (Terry, Chisholm, and Schonberg). Diagrams show general distribution and extent of epithelization in many of the cases reported. Heavy, wavy line indicates the location of epithelium within the eye.

1930, an attempt was made to eradicate the lens of a 17-year-old boy because of advanced progressive myopia. Following a discussion, a linear extraction was performed. Two more discissions were performed during the next three months. A cyst was removed from the anterior chamber in September, 1931.

The specimen proved to be the wall of an epithelial cyst.

Case 11. Path. No. 10,246. The blind, degenerated right eye of a 36-year-old woman was removed in January, 1936. The cornea showed a staphyloma and hematogenous pigmentation. A cataract had developed after an attack of "typhoid malaria" when the patient was 5 years of age. Numerous operations failed to restore vision.

On one side, epithelium was present on the surface of organizing hemorrhage in

the region of the iris angle. The epithelium was also on the anterior surface of the iris, extending past the pupillary area.

Case following Repeated Discissions

Case 12. Path. No. 9,266. In May, 1933, Dr. Paul A. Chandler completely removed an epithelial cyst from the left eye of a three-year-old girl. Two discissions for a congenital cataract had been performed within a period of one week in March, 1931.

Pathological examination confirmed the clinical diagnosis.

Cases following Perforated Corneal Ulcers

Case 13. Path. No. 781. A 64-year-old man developed an ulcer in the lower portion of his left cornea. When the ulcer

perforated, the iris prolapsed. Purulent endophthalmitis followed a Saemisch section. The eye was enucleated in 1902, one month after the perforation of the ulcer.

A "marsupial-like" epithelial cyst lined the anterior chamber. Its walls were continuous with the surface epithelium of the cornea. The pupil was blocked by organizing exudate.

Case 14. Path. No. 9,901. The blind, opaque, left eye of a 13-year-old girl was removed in 1934. The leukomatous cornea resulted from a severe infection during the first year of life.

A healed perforated ulcer was found near the limbus with a small epithelial cyst in the anterior chamber. Some goblet cells were present in the wall of the cyst. The cyst contained a slight amount of cholesteatomatous material and desquamated cells.

Cases following Accidental Perforating Wound

Case 15. Path. No. 690. In 1902, three years after a perforating wound, a 13-year-old boy developed iridocyclitis in his left eye. Fearing the possibility of sympathetic uveitis, the surgeon removed the eye.

There was a healed perforating wound of the cornea with partial iris prolapse. A strand of epithelium, with a small cyst at one end, was found between the iris and the cornea peripheral to the anterior synechia.

Case 16. Path. No. 2,528. Following repeated attacks of pain, lacrimation, and photophobia, the left eye of a 19-year-old boy was removed in 1914. Five years previously, a foreign body had been removed from the eye. Sympathetic uveitis was suspected because of disturbance in the right eye also.

A healed perforating wound of the cornea with partial prolapse of the iris

was found. Epithelium containing goblet cells was present on the anterior surface of the iris. There was no evidence of sympathetic uveitis.

Case 17. Path. No. 3,877. The disorganized right eye of a 23-year-old man was removed in 1920 because of pain during the past year. Sixteen years previously, the eye had been lacerated by a piece of steel. Following the accident, a traumatic cataract had been removed.

The epithelium covered the anterior surface of the iris and part of the posterior surface of the cornea. Goblet cells were relatively numerous in the epithelium. In one place the epithelium had invaded an iris crypt. An anterior synechia was present near the center of the cornea. Because the cyst was multilocular, sections through the synechia gave the appearance of two almost complete epithelial cysts.

Case 18. Path. No. 7,280. In August, 1936, a 58-year-old man sustained a severe lacerating wound of the right eye. The lens was expelled with vitreous prolapse. Suture of the cornea and application of a conjunctival flap failed to remedy the condition. The eye was enucleated 15 days later.

An inversion of the lacerated edge of the cornea was found with epithelium extending along the lips of the wound onto the partially prolapsed lens capsule.

Case 19. Path. No. 9,883. In 1935, the blind, painful right eye of a 78-year-old man was removed. Before enucleation the eye had been injured 40 years previously with loss of vision and again three years previously.

An epithelial cyst was found just beneath the perforation within the lens capsule. Its small size and healthy appearance suggested that it was caused by the second injury.

Case 20. Path. No. 10,218. A perforat-

ing knife wound of the cornea of the right eye of a 7-year-old girl in December, 1933, resulted in the formation of an epithelial cyst involving the iris. The cyst was completely removed 2½ years later. There has been no recurrence.

Epithelium was found covering the wall of the cyst.

Case 21. Path. No. 10,253. In June, 1936, the painful, blind, glaucomatous right eye of a 16-year-old girl was removed. In 1928, her eye had been perforated by a piece of broken eyeglass. A reparative operation was performed by her physician. Two additional operations (iridectomies) were performed in 1930.

A large epithelial cyst and several very small ones were found in the anterior chamber. It was possible that the large cyst was multilocular but connections between the apparent cysts were not demonstrated.

Case 22. Path. No. 10,559. In May, 1937, the painful inflamed, left eye of a 57-year-old man was removed. Four years previously, vision was destroyed by a perforating injury.

The anterior chamber was filled by an epithelial cyst that was connected with a cystoid space by an epithelial tract through the scar. Part of the posterior wall of the cyst was made up by a portion of the iris. At one place, the epithelium had lined an iris crypt.

Case 23. Path. No. 10,261. In June, 1936, a 50-year-old man was struck in the left eye by a piece of wood. A "bleb" appeared in a short time at the limbus in the lower nasal quadrant. Seven weeks later, an iris cyst was discovered and was removed.

The cyst wall was composed of epithelium, iris, and lens substance.

Case 24. Path. No. 10,725. The blind right eye of a 7-year-old girl was removed in January, 1938. Plastic iritis was pres-

ent, and sympathetic uveitis was suspected. The eye had been injured by a knife four years previously.

In the region of the perforating wound, an epithelial cyst containing cholesteatomatous material was found. A large multilocular cyst filled the anterior chamber. Posteriorly, in different regions, the epithelium was adherent to the iris, the separated retina, and the ciliary processes.

Case 25. Path. No. 10,796. From an injury with a piece of wood, in November, 1937, a 58-year-old man sustained a prolapsed iris and a dislocated lens. Seven weeks later, the prolapse was excised and an attempt was made to remove the dislocated lens. In February, 1938, the blind, painful, inflamed eye was removed.

Epithelium was found extending through the scar into the anterior chamber. A cholesteatomatous cyst was present some distance from the scar. The iris angle on the side opposite the injury was closed by a broad anterior peripheral synechia.

Case 26. Path. No. 10,741. The blind left eye of a 4½-year-old boy was removed in July, 1937. A lacerating wound of the globe from a fall on a bottle in April, 1933, resulted in prolapse of the iris, ciliary body, and vitreous. The injury was repaired by a conjunctival flap.

A multilocular epithelial cyst replaced the posterior chamber. No anterior chamber was present. The posterior wall of the cyst was bounded by remains of lens in one region and by retina in another.

Case 27. Path. No. 10,739. The painful right eye of a 35-year-old man was removed in 1937. Twenty years previously the eye was blinded by a knife wound.

Behind the pseudo-cornea, the anterior chamber was filled with an organized exudate. Blocking the pupillary area was an epithelial cyst filled with cholesteato-

matous material. A similar, smaller cyst blocked the angle on one side and extended posteriorly into the ciliary body. The epithelium lining this cyst appeared to be devitalized.

Case 28. Path. No. 2,339. In 1913, the right eye of a 50-year-old man was injured by a piece of stone. In one week a large corneal ulcer developed. It perforated 18 days after the injury. Eight weeks after the accident, photophobia and precipitates on Descemet's membrane de-

quent in males (8) than in females (0). Men are employed in occupations more likely to give rise to perforations of the eye. The greater frequency of accidental perforation of the eye in man may be responsible for the greater incidence of epithelization (17 males and 11 females). It is recognized, of course, that there are not enough cases in this study to make these generalizations of real value. Epithelium cannot arise in the eye by metaplasia. It is introduced into the eye

TABLE 1
DISTRIBUTION BY AGE AND SEX AND BY OPERATION OR ACCIDENTAL PERFORATION

Cause of Perforation		Number of Cases							
	Decade	1	2	3	4	5-6	Over 6	Unknown	Total
Male	Accidental	1	1	1	1	2	3	1	10
	Operation		3						3
	Both		1				2		3
	Unknown		1						1
Female	Accidental	1	2						3
	Operation	1			1		4		6
	Both		1						1
	Infection ? Perforating ulcer	1							1
Total cases									28

veloped in the left eye. A diagnosis of sympathetic uveitis was made and the sympathogenic eye was enucleated.

A healed regular scar was present near the limbus on one side. Central to this only a pseudo-cornea remained. Epithelium was present between the pseudo-cornea and the iris, apparently binding the two together. Sympathetic uveitis was present.

DISCUSSION

Although the frequency of epithelization from accidental perforations is relatively the same in males and females in the first and second decades of life (2 males and 3 females), the incidence of epithelization following accidental perforation after adult life is much more fre-

quent in males (8) than in females (0). Men are employed in occupations more likely to give rise to perforations of the eye. The greater frequency of accidental perforation of the eye in man may be responsible for the greater incidence of epithelization (17 males and 11 females). It is recognized, of course, that there are not enough cases in this study to make these generalizations of real value. Epithelium cannot arise in the eye by metaplasia. It is introduced into the eye

in three ways: by implantation; by a flap of conjunctival or corneal tissue turned into the eye; and by ingrowth of epithelium proliferating along the open tract of a gaping wound, possibly along a stitch, and along prolapsed material. Accidental implantation has been observed where a cilium from the lid was carried into the anterior chamber.⁵ In case 12 the introduction was more or less instantaneous, occurring during a discission. Grossly invisible irregularities on cutting instruments can carry epithelial cells into the eye (fig. 3). Although many epithelial cells capable of proliferation within the eye may be implanted, to produce epithelization they must reach "fertile soil."

A ragged edge of conjunctiva with

epithelium attached frequently results from incisions with a cataract knife if a conjunctival flap is made with the knife. Such ragged edges can fold into the eye. Similar conditions may be found more frequently in accidental, lacerating, or puncture wounds of the eye with or without intraocular foreign bodies. Although operative wounds of the eye greatly outnumber accidental perforations, in approximately 50 percent of the cases in

delirium tremens four days after a cataract extraction. A pathologic study of the eye obtained at necropsy showed that the epithelium had completely lined the lips of the wound and also had extended over the posterior surface of the cornea for a distance of 0.5 mm. Experiment 1, rabbit C, showed epithelium in the anterior chamber in 48 hours (fig. 4). It appears, then, that epithelium can grow along a wound to reach the anterior

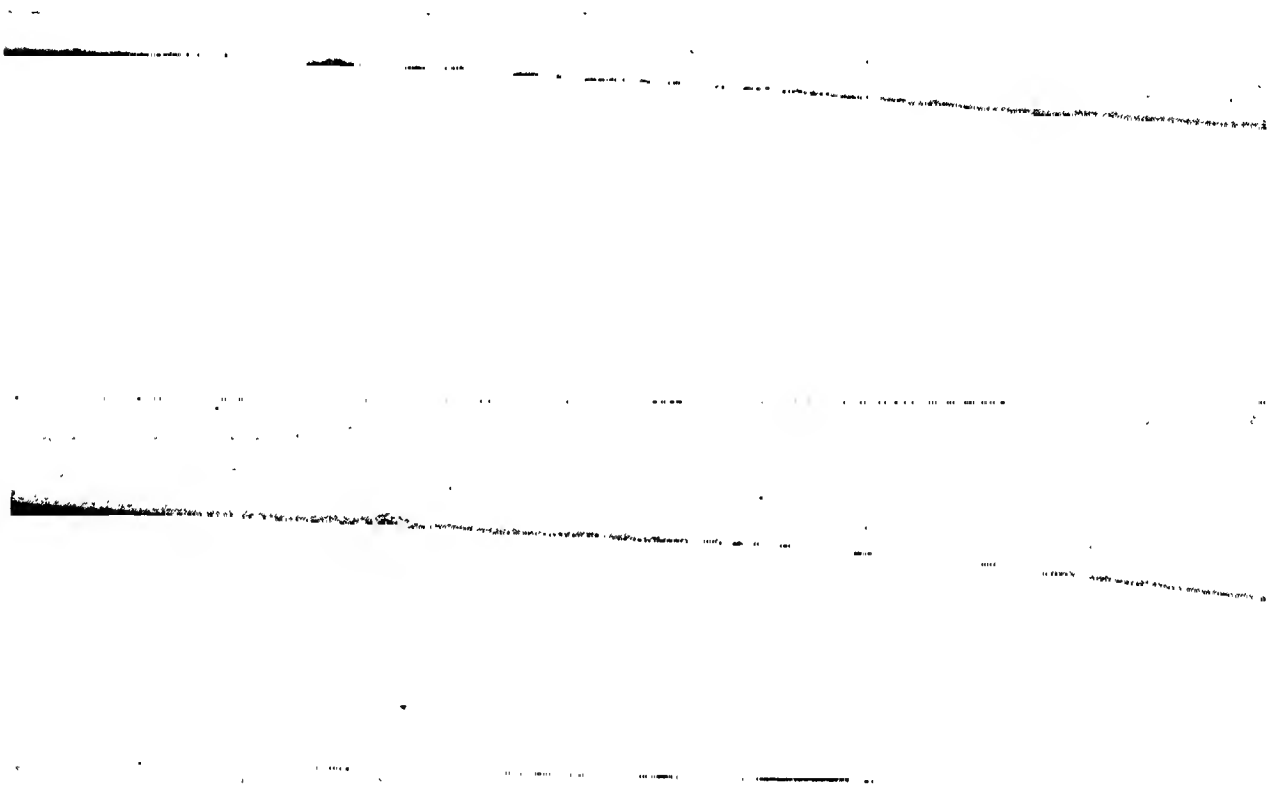


Fig. 3 (Terry, Chisholm, and Schonberg). Photograph of edge of sharp new cataract knife and keratome at same magnification as in figure 21. Note irregularities in cutting edges, large enough to carry basal epithelial cells into the eye in the form of "saw dust." Basal cells are mentioned because they can grow if planted into the proper medium.

this series epithelization followed accidental perforating wounds.

The surface epithelium grows along the cut edge of the wound until it meets a barrier. If none is present, the epithelium invariably extends to the very edge of the anterior chamber and infrequently the growth may continue so that the epithelium invades the interior of the eye. Meller⁶ reported a case of epithelium in the anterior chamber of a man who died in

chamber in less than four days.

In a specimen obtained by Verhoeff in 1901, epithelium had grown along a scleral stitch in eight days (fig. 5). A study of this section brought to mind the possibility that epithelium might gain access to the interior of the eye along a stitch if the stitch entered the anterior chamber and remained in place long enough. With corneoscleral stitches gaining in popularity, this consideration is

very timely. The corneoscleral stitch should not extend into the anterior chamber. It is possible that the deep lip of the wound may gape, exposing the stitch to aqueous. One of us (T. L. T.) has observed a flat anterior chamber with corneoscleral stitch in two instances. In each case the leakage appeared to be in the region of the stitch as determined by dilution of fluorescein by leaking aqueous.

into the wound, according to Corrado,² would favor epithelial invasion of the eye. The prolapsed material, serving as a wedge to keep the lips of the wound apart and to delay healing, would tend to maintain hypotony as well. Prolapsed material was present in 10 cases in the series (35.7 percent). It was lens capsule in one case and iris in nine cases. No evidence of vitreous prolapse was found. It is possi-

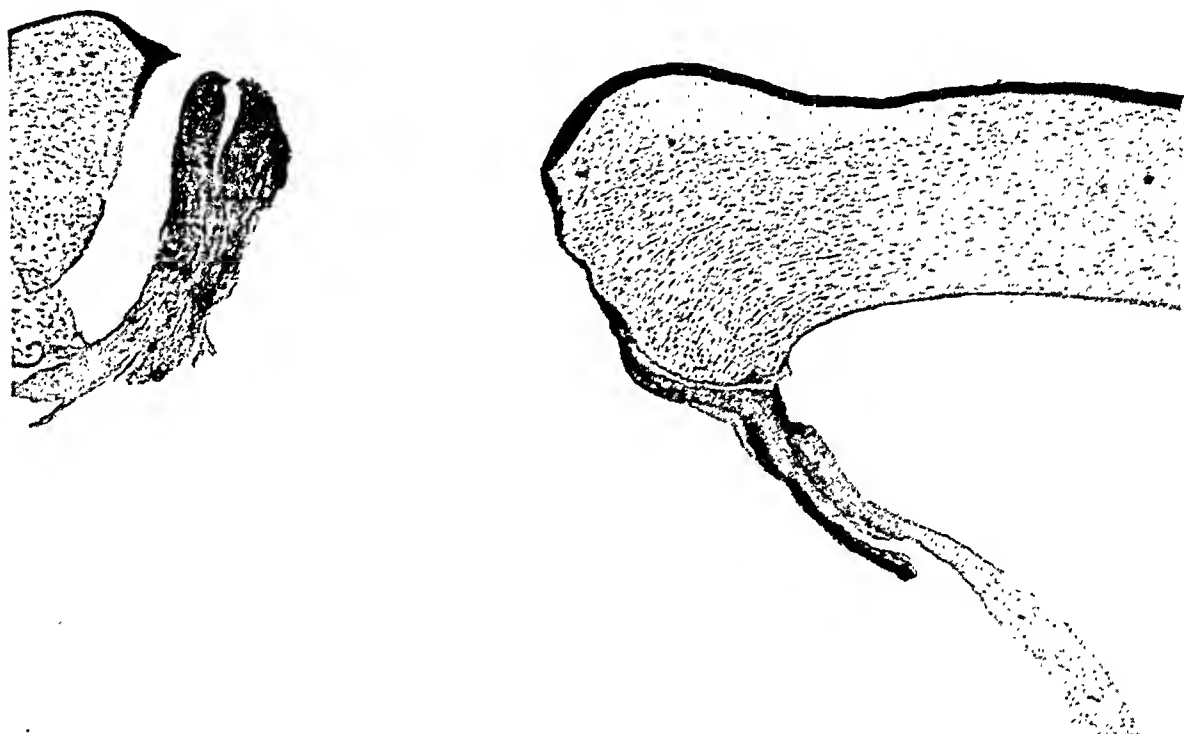


Fig. 4 (Terry, Chisholm, and Schonberg). Epithelium has grown along the cut edge of the wound on one side and into the anterior chamber along a strand of coagulated plasmoid aqueous, 48 hours after experimental perforation of the cornea from the rear by means of a narrow keratome introduced at the limbus in rabbit C.

In each instance it was considered advisable to remove the stitches, which were considered to be acting as drainage wicks. Some of the experiments were made to investigate the growth of epithelium along a stitch. Although the epithelium in no instance penetrated into the anterior chamber, it was obvious that epithelium does have a tendency to grow along stitches. (fig. 6).

The presence of any prolapsed material

ble that vitreous may have prolapsed, keeping the wound open for a period of time. All traces of vitreous prolapse may have been lost because of contraction of the scar tissue. Only a few sections through the wound are available in some cases and evidence of prolapse of various materials may have been lost.

Hypotony alone as an essential factor seems unimpressive. Frequently spontaneous or operative perforation of the cornea

complicates hypopyon ulcer. The wound may be kept open for several days maintaining an extremely low tension, yet the incidence of epithelization following perforating ulcer is very small. Epithelization occurred in only two cases of ulcera-

This perforated wound remained widely open, draining for five weeks, until the wound was closed by a conjunctival flap. Fear of epithelization was partly responsible for operative closure of the wound. In this case the day after the flap

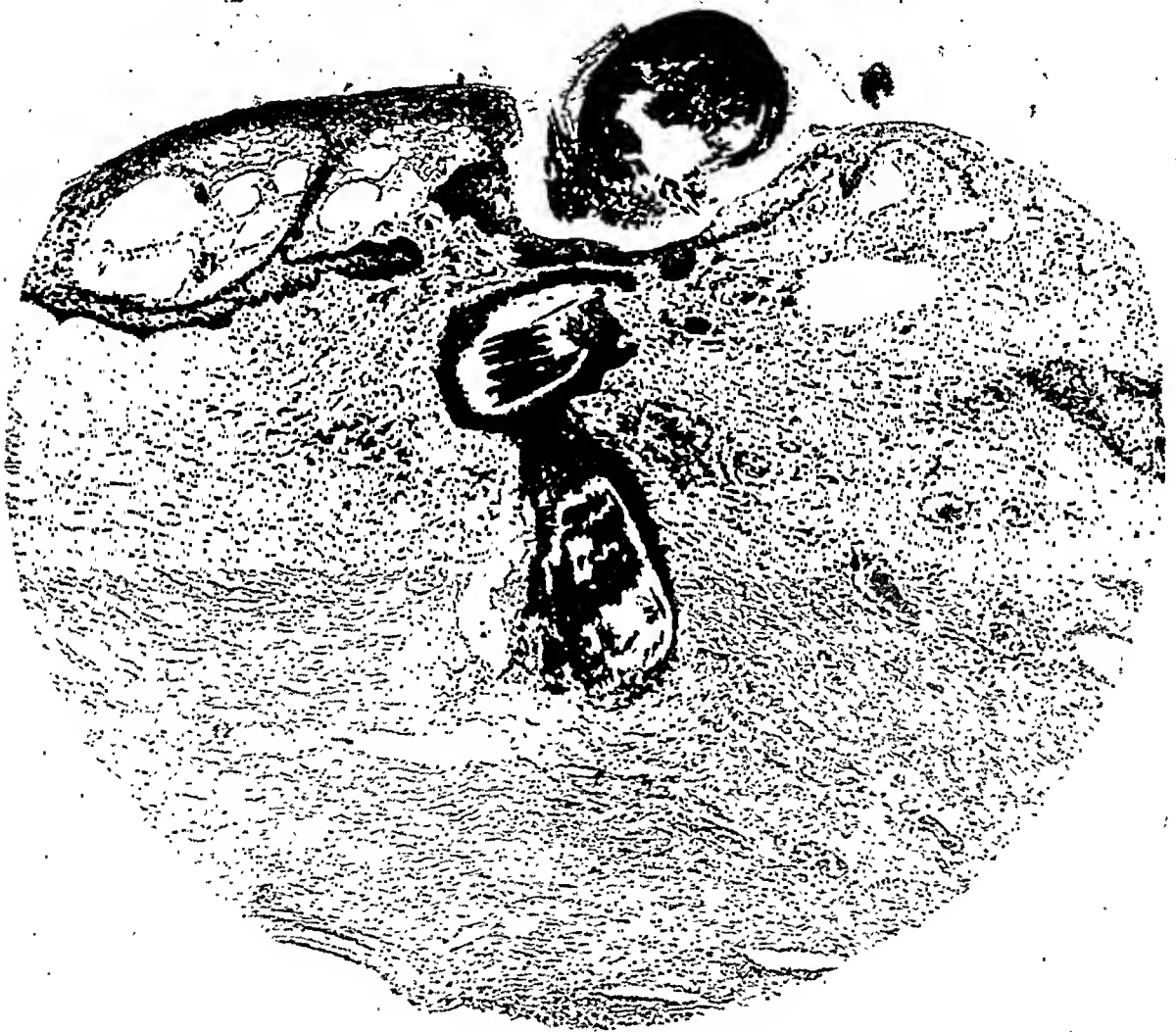


Fig. 5 (Terry, Chisholm, and Schonberg). From Verhoeff. Epithelium has grown along a stitch in the sclera. The eye was removed eight days after repair of a perforating wound.

tive keratitis in this series (cases 13 and 14 and possibly 28), one of which was treated by Saemisch section. In a case of keratoconus following therapeutic cauterization and puncture of the cornea, a very wide perforation, some 3 mm. in diameter, was unintentionally produced.

was applied, the anterior chamber became reestablished. The patient has been followed for five years, and no clinical evidence of epithelization has been observed. Conversely epithelization occurred in case 2, even though glaucoma was present before and after the operation. Case

12 showed epithelization following discissions which could not have caused subnormal tension for a period longer than a few hours at most.

Because of repeated operations, the exact length of time intervening between introduction of the epithelium and the removal of the specimen is uncertain in some instances. Allowing the longest time

and 3 years before enucleation, epithelization was most probably the result of the more recent perforation.

The location of accidental perforations is difficult to summarize. Only a few of the case records gave the size, shape, and location accurately. In some of the cases, the lacerating wounds extended into the limbus. In all instances of operative

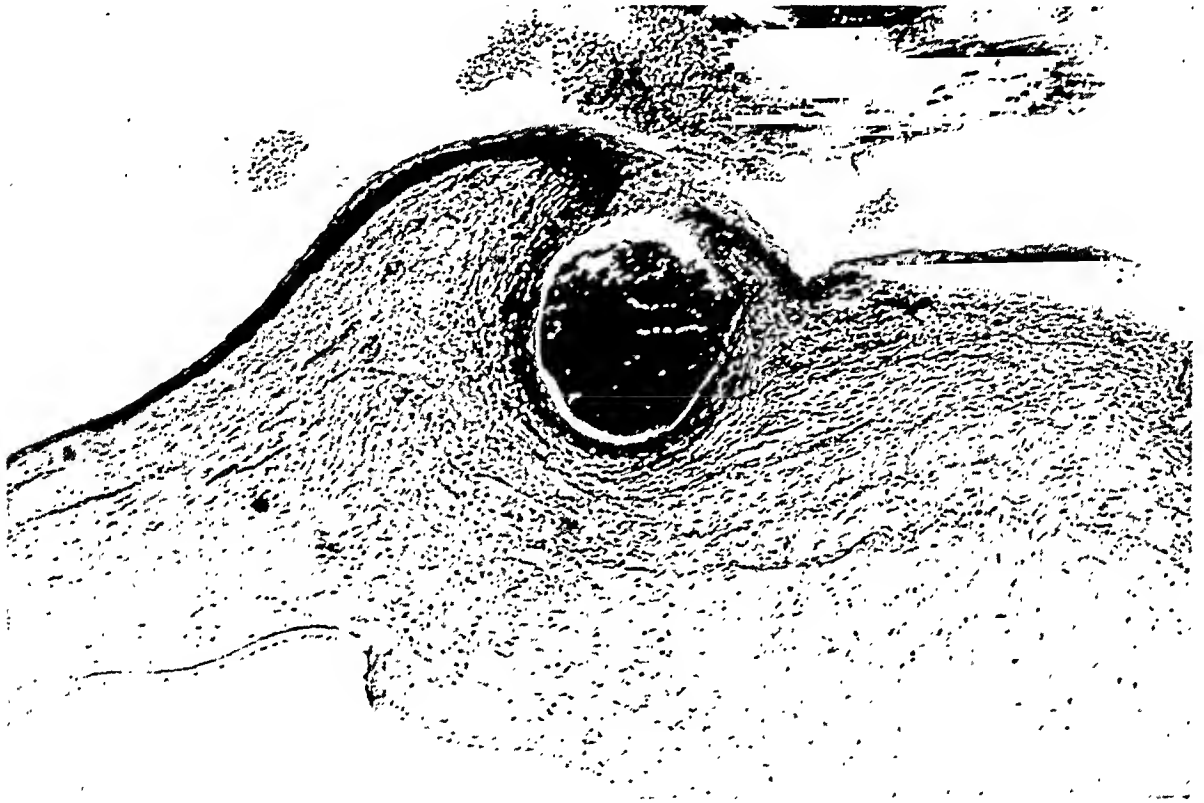


Fig. 6 (Terry, Chisholm, and Schonberg). Epithelium has grown along a stitch in the cornea of a rabbit. The eye was removed 25 days after the stitch was introduced.

interval, it is interesting to note that the specimen was removed within one year in seven instances, within two years in five instances, a total of 43 percent, an indication that epithelization tends to take hold and spread without great delay. Epithelium does not seem to enter, lie dormant for a few years, and then be stimulated into growth subsequently by various changes in the eye. In other words, if epithelization is to occur, evidence can be seen probably within one year, or at least within two years. In case 19, for instance, a perforation having occurred 40 years

wounds, the perforation was made approximately at the limbus.

Given sufficient time, aberrant epithelium growing within the eye should line the entire anterior and posterior chambers, and if the vitreous is fluid line the entire eye. This would be prevented by some barrier. In its broad sense there can be three types of barriers; namely, mechanical, chemical, and nutritional.

The growth was limited by mechanical barriers, with or without cyst formation in some instances. Mechanical barriers were found to be as follows: lens capsule;



Fig. 7 (Terry, Chisholm, and Schonberg). Case 19. Lens capsule is a mechanical barrier preventing the spread of epithelization.

exudate, usually in the form of organized fibrous tissue; vitreous; and the so-called endothelium on the back of the cornea.* Case 19 shows only a very small amount

of epithelium within the anterior chamber, all within lens capsule that is par-

tard or stop epithelization, it must be considered also as a mechanical barrier but of a somewhat different type (*vide infra*).

* If increased intraocular pressure does re-

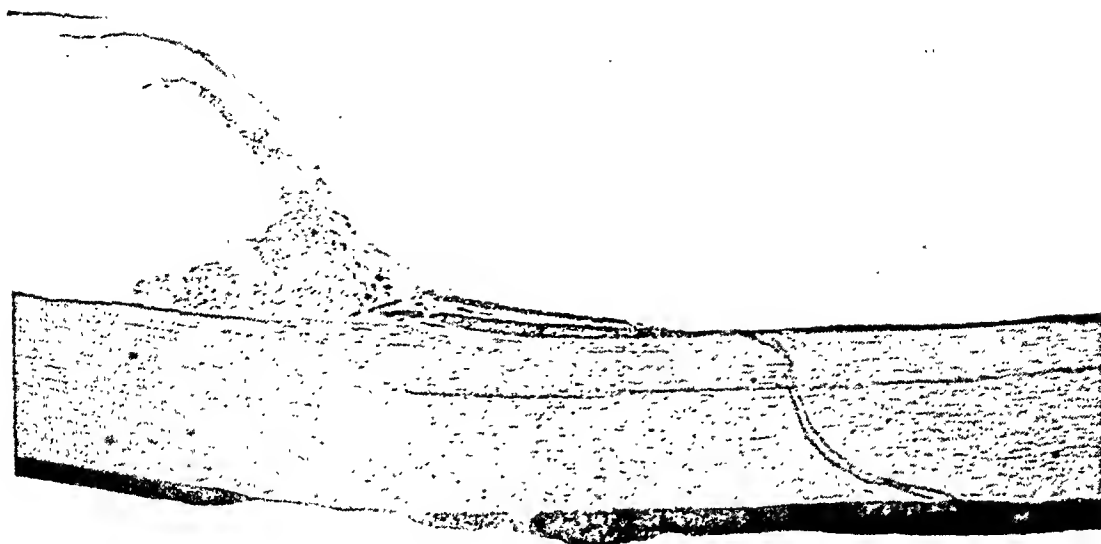


Fig. 8 (Terry, Chisholm, and Schonberg). Case 3. Organized exudate is preventing the spread of epithelization. Several strands of epithelium are found enmeshed in the barrier at different levels.

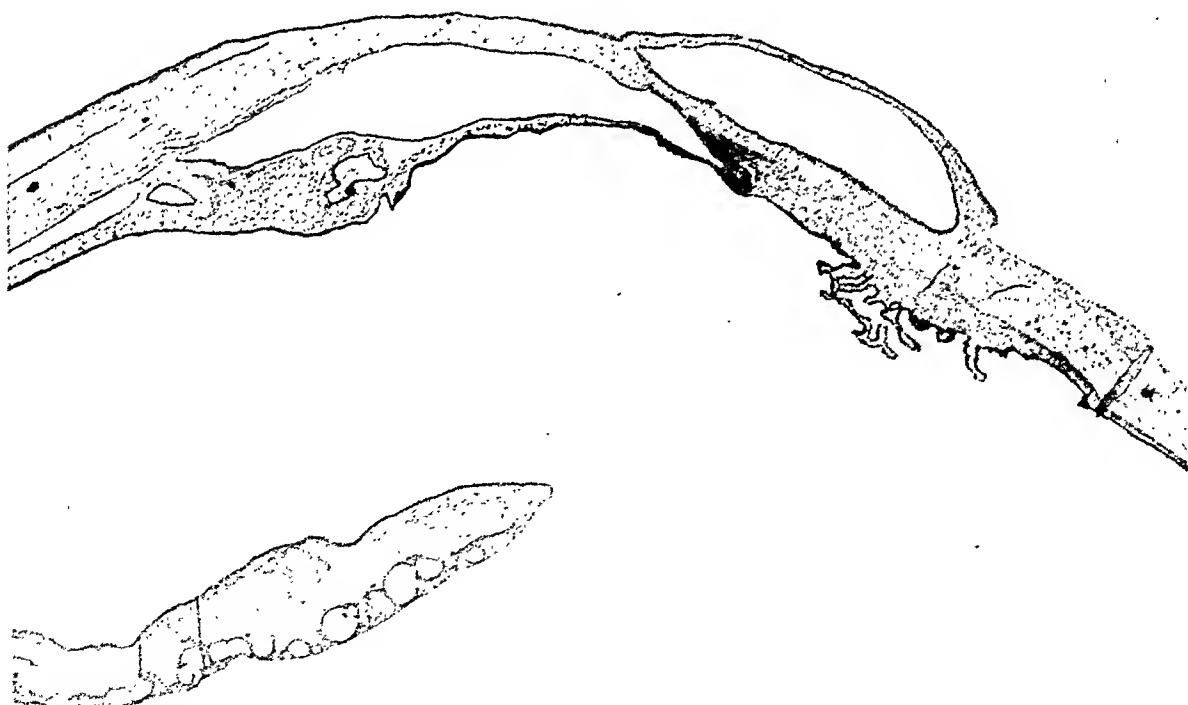


Fig. 9 (Terry, Chisholm, and Schonberg). Case 22. There appears to be a cystoid cicatrix in the episclera at the limbus separate from the epithelization within the eye. Other sections at different levels show that the two parts are really continuous. Note the unusual thickness of the epithelium in the false angle on the side of the episcleral cyst.

tially prolapsed into the wound (fig. 7). Other instances show lens capsule obstructing the growth of epithelium. Exudate, usually organized, is a definite mechanical barrier in other instances (fig. 8).

Cyst formation is the logical consequence of a sufficiently broad barrier to the spread of epithelium in the anterior

ment. Few, if any, wandering cells could penetrate through the aberrant epithelium into a cyst. These phagocytes, then, must have been present early in the development of the process to be surrounded by the growth of the epithelium. These clusters of cells resemble remotely the remains of an old hypopyon before it is completely absorbed or digested.

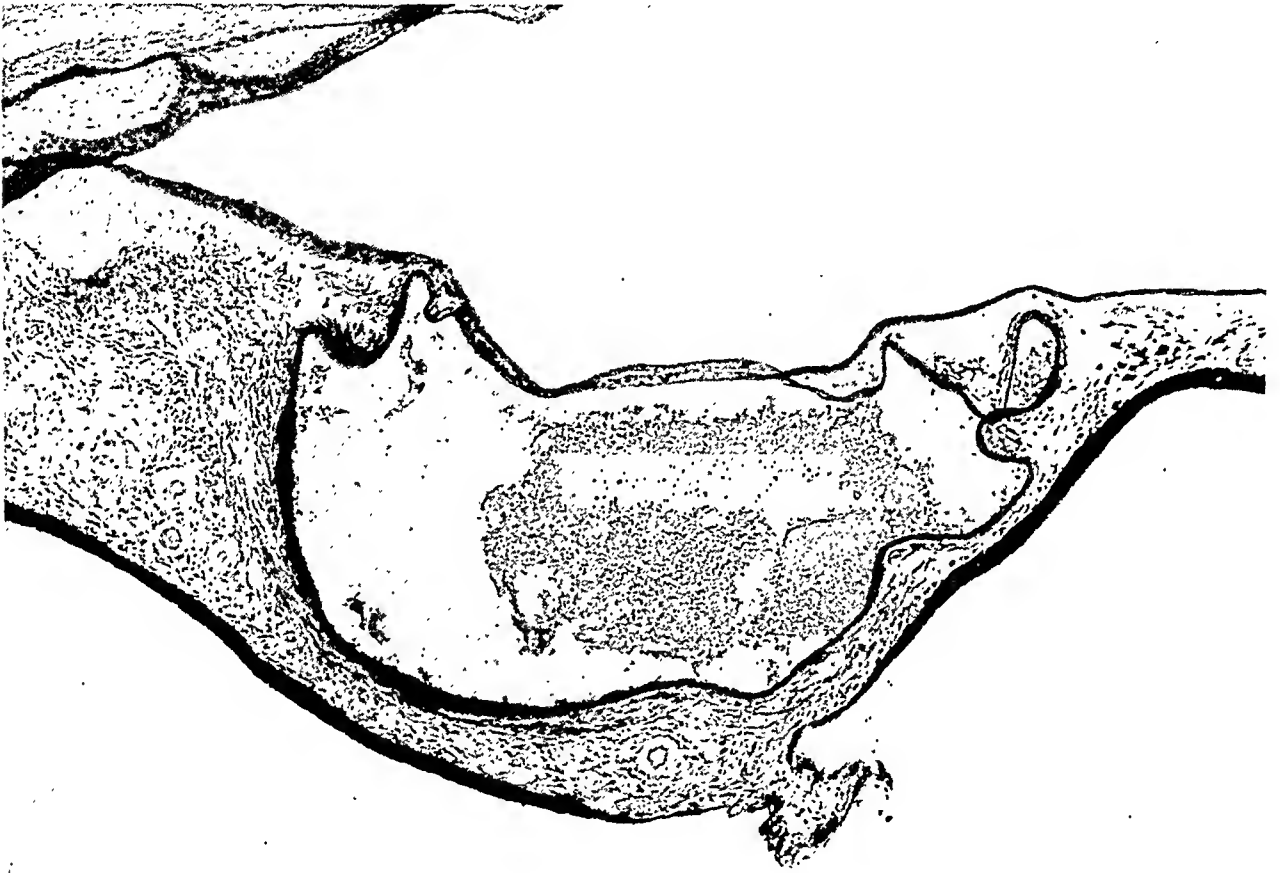


Fig. 10 (Terry, Chisholm, and Schonberg). Case 22. Epithelium has lined an iris cyst. At other levels a relatively small connection between the crypt and the anterior chamber is present. Note the so-called cholesteatomatous material in the crypt, too thick and too large in amount to be discharged from the crypt. Such particulate matter, derived from epithelium in cases where the epithelium has not grown over the iris angle, could block the meshwork and produce glaucoma.

chamber (figs. 9-15). In many instances the cyst is enlarged by accumulation of degenerated, exfoliated cells into the center of the cyst. Exfoliated and degenerated epithelial cells are not the only contents of almost complete or complete cysts. In cases 4 and 25 a collection of degenerating cells, probably phagocytes, were present (figs. 16 and 17). Some of the cells contained granules of uveal pig-

ment. As the cyst enlarges, the walls are stretched and rendered more difficult to identify. It is, of course, no problem to identify the cornea or the remains of the iris however deformed or atrophic. Many of the cysts have a portion of their wall made up of newly formed tissue separating the cyst from the remainder of the anterior or posterior chamber. This wall has a thinned-out, poorly nourished layer

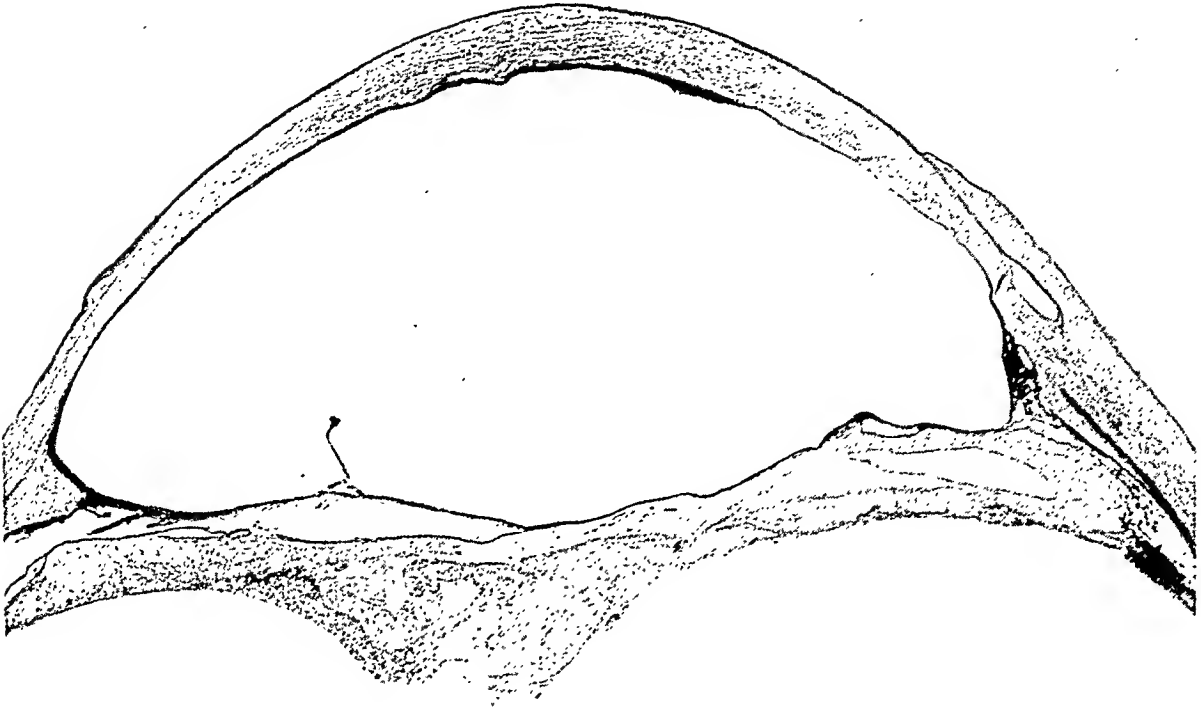


Fig. 11 (Terry, Chisholm, and Schonberg). Case 26. Epithelial cyst has involved anterior chamber and most of posterior chamber. Note iris adherent to back of cornea on one side and long oblique tract of epithelium extending from corneal surface deeply into sclera on opposite side. After incomplete removal of implantation cyst the recurring cyst usually involves both anterior and posterior chambers.



Fig. 12 (Terry, Chisholm, and Schonberg). Case 21. The connection between the epithelium-lined cystoid cicatrix at the limbus and the anterior chamber is shown. In other sections this appears to be made up of several separate cysts.

of surface epithelium on its inner surface and a very thin layer of pigmented tissue, usually one cell thick, on its outer surface. It is probable that this layer is derived from scar tissue that had formed a synechia between the iris and the cornea or between the iris and the remains of the

cornea. Experiments made appear to establish proof of this conception* that corneal endothelium is a mechanical barrier to epithelization (fig. 18). However, one cannot say that endothelium on the anterior surface of the iris is a barrier because it is too difficult to demonstrate in

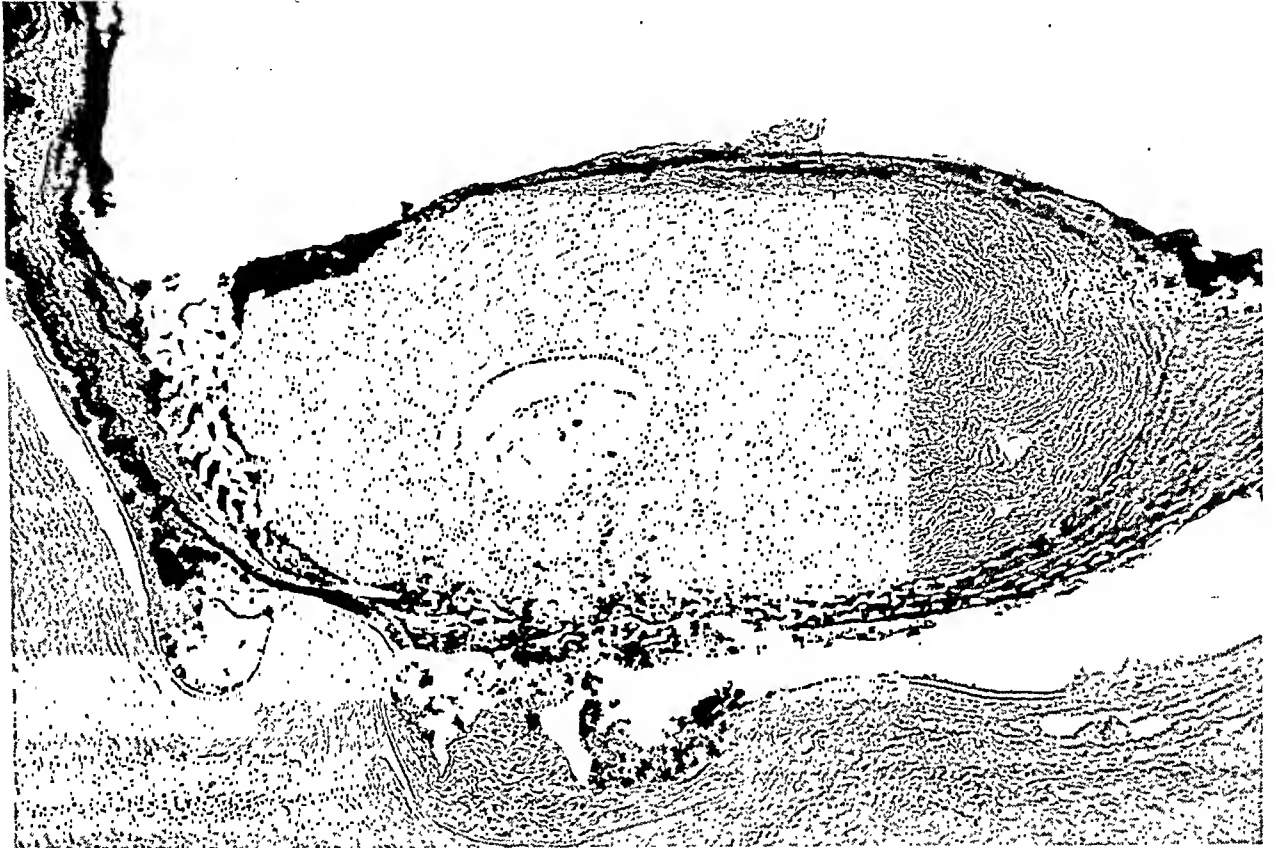


Fig. 13 (Terry, Chisholm, and Schonberg). Implantation cyst in scar tissue in iris stroma. The epithelial implant was inserted into the eye of a rabbit 70 days previous to the enucleation. Note the cholesteatomatous contents. It is doubtful whether the epithelial cyst could increase in size very much because of the extremely thick surrounding scar-tissue reaction. This wall, in part, is subepithelial conjunctiva.

lens. A proliferation and metaplasia of the iris pigment epithelium is responsible for the pigmented cells.

It had occurred to one of us (T. L. T.) that epithelium grew on the back of the cornea when the usual endothelium of the cornea was absent. Of the eyes studied, not one showed epithelium growing over the endothelium. The accidental removal or fatal injury of the *endothelium* appears to be one of the necessary criteria for epithelization to occur on the *back of the*

the normal eye, much less under a layer of aberrant epithelium. Surface epithelium grows more readily, more frequently, and more extensively on the anterior surface of the iris than on the back of the cornea.

It is evident that the posterior epithelial

* Although this was an original idea and experiments were started September 2, 1937, no previous publication has been made of this work. In October, 1937, Fry suggested this possibility in his discussion of Perera's paper.

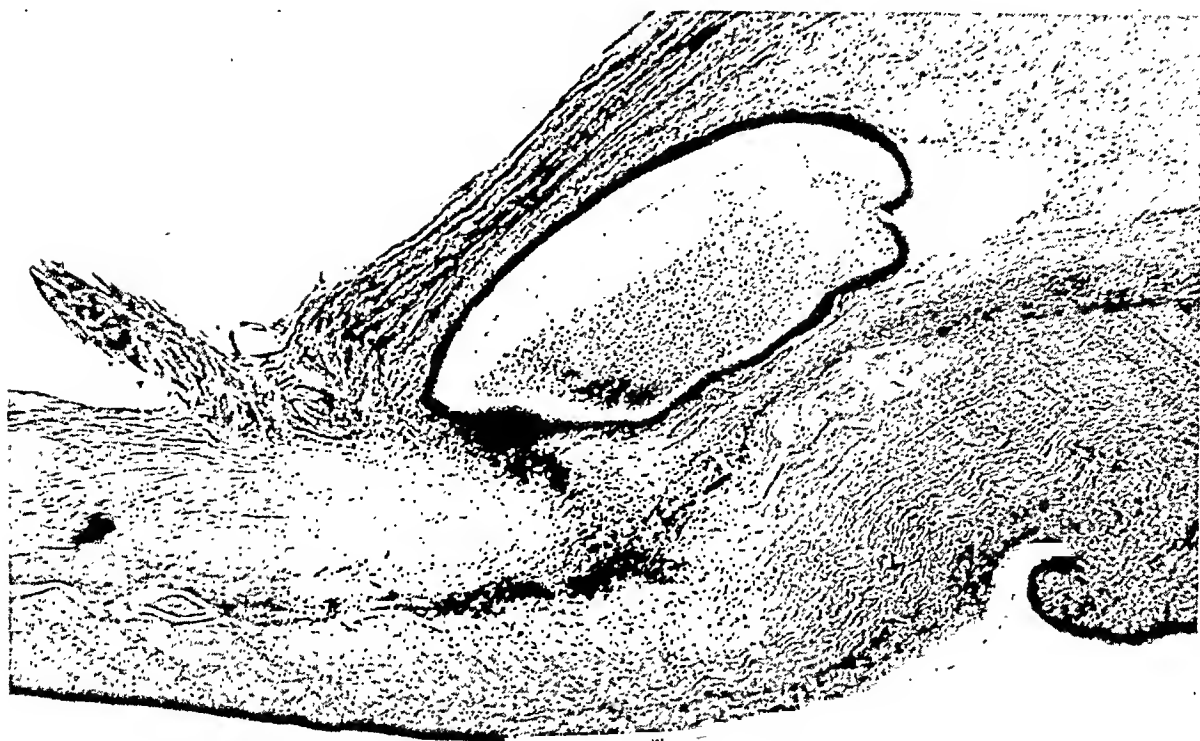


Fig. 14 (Terry, Chisholm, and Schonberg). Epithelial cyst on iris following implantation of conjunctival flap into a rabbit 120 days before the enucleation. Note the accretion of exfoliated cells.



Fig. 15 (Terry, Chisholm, and Schonberg). An epithelial flap was inserted into the anterior chamber of a rabbit after the posterior surface was scarified. The cyst, so apparent here, is not really complete.

layer of the iris (pars iridis retinae) and the ciliary epithelium are not barriers. In one most notable instance, case 2 (figs. 19 and 20), the epithelium had grown from the anterior surface of the iris around the pupillary margin onto the surface of the pigmented epithelium on the

the aberrant epithelium stops short of lining the entire area exposed to it, some form of barrier other than mechanical must be present. As already stated, chemical and nutritional barriers may and most probably do exist, although it is impossible to be sure which of the two is



Fig. 16 (Terry, Chisholm, and Schonberg). Case 4. A mass of macrophages surrounded by growth of epithelium. The similarity to the microscopic appearance of an old hypopyon is evident.

back of the iris. It extended over the intact healthy-appearing epithelium and even onto the anterior surface of the vitreous for a short distance. Case 3 (fig. 21) also shows that surface epithelium can adhere to apparently normal retinal epithelium on the back of the iris as if it were growing on the surface of raw, uncovered, mesodermal tissue. Epithelial-like tissue originating from neural ectoderm appears to offer no barrier to the growth of the aberrant surface epithelium. In cases 24 and 27, aberrant epithelium was growing on separated retina.

When mechanical barriers are entirely lacking, sufficient time has elapsed, and

the responsible agent in preventing extension of the epithelization in any one specific case.

A chemical barrier would probably be in the form of a toxin elaborated within the eye from stagnation of the aqueous in glaucoma, or from the aberrant epithelium itself through the medium of necrosis or desquamation. If this latter possibility were true, then with formation of a cyst the epithelial cells lining it should be destroyed by toxins elaborated from the exfoliated accretions. A cessation of growth would invariably result.

It is further possible that normal aqueous of the healthy eye may be a barrier,

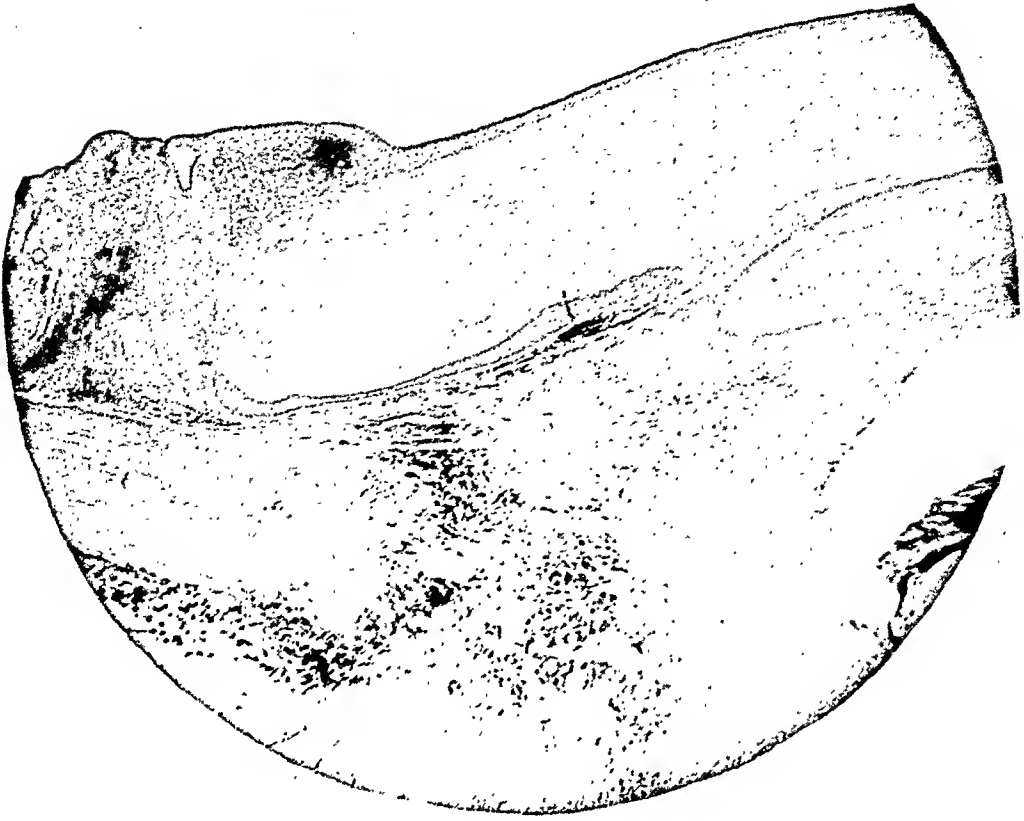


Fig. 17 (Terry, Chisholm, and Schonberg). Case 25. A strand of epithelium can be followed from the surface of the eye along the healed perforated wound into the anterior chamber. Apparently disconnected with this strand is an epithelial cyst containing exfoliated material and macrophages.



Fig. 18 (Terry, Chisholm, and Schonberg). Epithelium growing on the back of the cornea in a rabbit after traumatic destruction of the endothelium. Descemet's membrane was dislocated. Note its curled-up edge. The eye was enucleated 25 days after the abrasion of the posterior surface of the cornea and the implantation of the conjunctival flap.

although the barrier here may be more a lack of nutrition than a growth-retarding chemical. In discussing Krug's⁷ paper on epithelial cysts of the posterior chamber, one of us (T. L. T.) suggested that the fact that "the epithelium is reduced to one or two layers in the region of the cyst exposed to the aqueous, and that the

bed. The epithelium almost invariably appeared less healthy on the back of the cornea and least healthy in that portion of cysts where the epithelium was separated from the aqueous by a thin, stretched connective tissue. In fact Suzuki⁴ who has produced epithelization experimentally, feels that his success has



Fig. 19 (Terry, Chisholm, and Schonberg). Case 2. Epithelium is present on the anterior and posterior surfaces of the iris, and on the ciliary epithelium and extends onto the vitreous for a short distance. Cystic spaces in the epithelium over the ciliary epithelium and vitreous represent the activity of goblet cells. Note the anterior peripheral synechia. The false angle only, not the iris-angle meshwork, is covered by epithelium.

central area of this free portion shows necrosis of epithelium, may indicate that the aqueous does not bring sufficient nutrition or that there is some growth-retarding factor in the aqueous."

In most cases the growth of the epithelium was thicker and appeared healthier on the anterior surface of the iris where there is greater proximity to a vascular

depended on carrying adequate nutrition along with the epithelium, a point worthy of careful consideration. Plasmoid aqueous, met with in all leaking perforations, would probably not contain inhibiting factors present normally in the aqueous.

Gundersen⁸ recently reported experimental work concerning the result of inserting a piece of cornea, obtained from

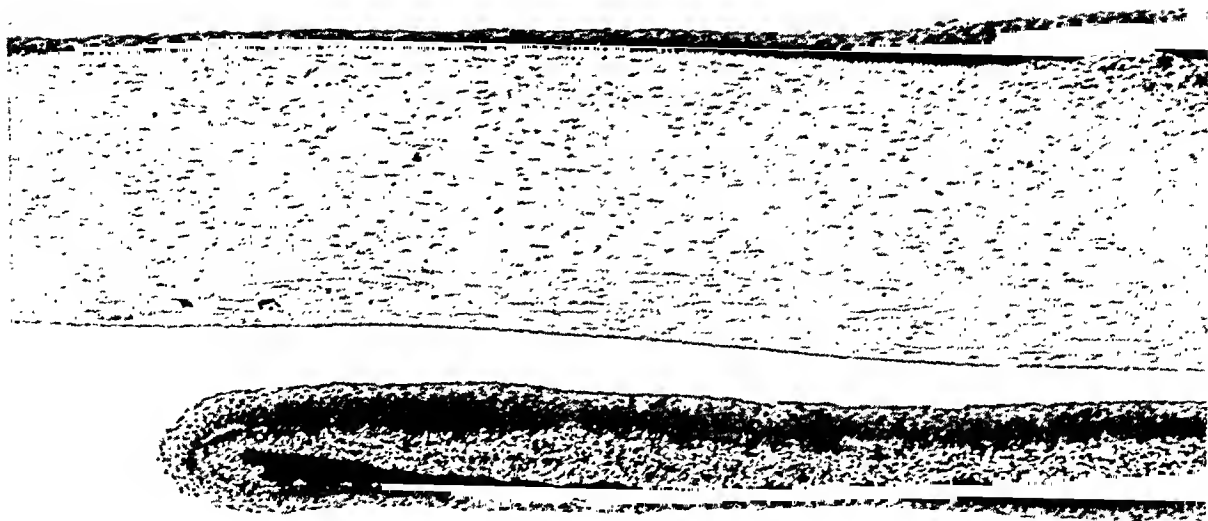


Fig. 20 (Terry, Chisholm, and Schonberg). Case 2. Opposite side. High power, Note entropion uveae produced by the epithelium, extending onto the posterior surface of the iris.

the one eye by means of a trephining into the anterior chamber of the other eye in cats and rabbits. He concluded that aqueous did not supply sufficient nutrition to

the epithelium to keep it alive. However, various types of tissue have been put into the anterior chamber. In many instances, the tissue is absorbed or replaced by scar



Fig. 21 (Terry, Chisholm, and Schonberg). Case 3. Epithelium on anterior and posterior surface of iris and on ciliary body. Several X-ray treatments were administered prior to enucleation of the eye.

tissue.⁹ In other instances, however, ovarian tissue has lived and shown definite functional activity, especially in castrated animals.¹⁰ Attempts to produce ovulation have been successful in rare instances, but attempts to fertilize the ovum by means of injection of spermatozoa or to implant a fertilized ovum into the anterior chamber failed.¹⁰ Endometrium implanted in the anterior chamber has gone through phases of blushing and blanching.¹⁰ Although this may indicate that normal aqueous would permit more or less normal function of the transplanted

sent the effect of pressure. Some of the epithelial growth contains a relatively large number of goblet cells. As Meller⁶ has suggested, this seems indicative that the epithelium within the eye has its origin from conjunctival epithelium that normally contains goblet cells. No keratinization, glandular cell growth, hair follicles, nor other evidence of skin epithelium were found in any specimen.

The growth force of the invading epithelium should be considered. Mention is made by Meller⁶ of epithelium insinuating itself between Descemet's membrane and

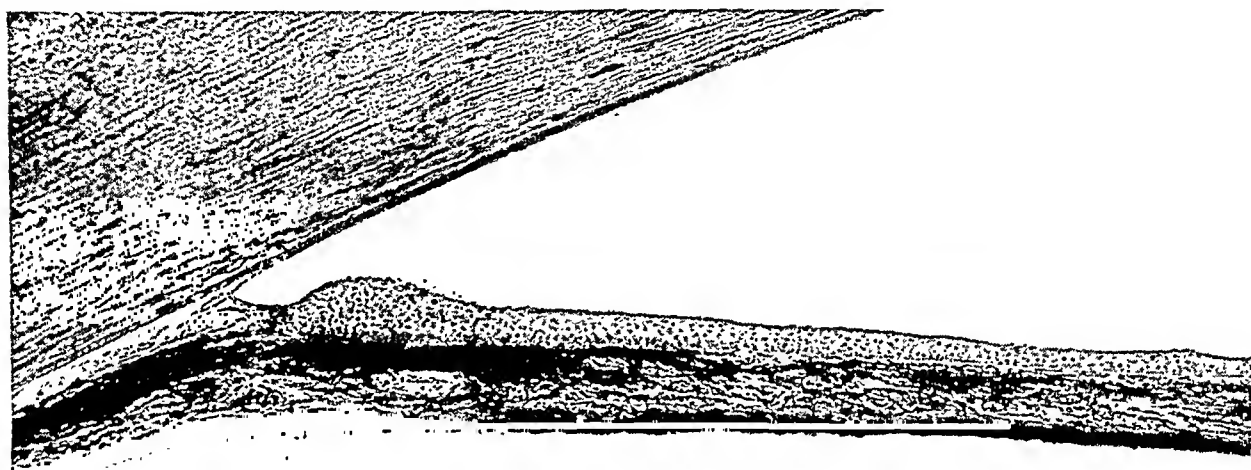


Fig. 22 (Terry, Chisholm, and Schonberg). Case 16. Note piling up of epithelium at growing edge of process. On the back of the cornea the piling up would appear as the gray line delineating the extent of the epithelization.

tissue, the grafted tissue invariably appeared to obtain a blood supply from the iris.

The epithelium varied in the nature of its growth. Growth never appeared extremely rapid, at least mitotic figures were not commonly observed. The cells may be piled up in stratified squamous epithelium 8 to 12 layers thick in one region, only to thin down to a stratification of 2 to 3 cells in a very short distance on the same supporting tissue; that is, iris or cornea. The surface cells often but not always show flattening to a marked extent. Although the flattening varies in different parts of the eye, it may repre-

the substantia propria, as if the epithelium had force of growth sufficient to peel off Descemet's membrane. From a study of the illustrations of this case it is apparent that the epithelium did not force itself beneath an *attached* Descemet's membrane but that it grew on the back of the cornea beneath a partially *detached* Descemet's membrane. However, it appears that the epithelium can force its way along the posterior surface of the cornea, possibly killing and later replacing the adjacent endothelium. The zone in which the endothelium is being destroyed or in which the epithelium is advancing may appear as a gray line. In case 16, the

epithelium on the iris is piled up at its edge (fig. 22). A piling-up at the growing edge in this manner may produce the gray line seen at times on the back of the cornea. In case 3, unsuccessfully treated by X ray, the epithelium appears as healthy and with as much "growth force" as in other cases (fig. 21).

From the literature, the impression is gained that glaucoma is present invariably with epithelization following blockage of the iris-angle meshwork by the epithelial

be destroyed or pushed out by the contraction of sclerosing fibrous tissue in the angle. Again, the glaucoma in many instances, where the epithelium was not confined to a cyst, may have its origin from blocking of the iris-angle meshwork by particulate matter of a cholesteatomatous nature derived from desquamated epithelial cells. In one instance, case 13, a "marsupial-like" pouch had formed opening externally through the portion of the cornea destroyed by the ulcer (fig. 23).



Fig. 23 (Terry, Chisholm, and Schonberg). Case 13. Epithelium lining the anterior chamber following cauterization of corneal ulcer. The "marsupialization" of the anterior chamber has occurred.

growth. The tension was normal or subnormal before enucleation in 10 cases, was elevated in 8 cases, and was not recorded in 10 cases. In most of the instances without glaucoma, the ciliary body appeared healthy. It is evident, then, that glaucoma is not invariably present. Usually when glaucoma was present, the iris-angle meshwork was sclerosed or peripheral anterior synechiae were present. It is possible that the epithelium may have been present in the angle in some instances to

In case 21, the epithelium lined a tract through the sclera with a subconjunctival cystoid cicatrix connected with the intraocular cyst (fig. 12). The fact that epithelization occurred in case 2, when glaucoma was present before and after the operation, indicates that epithelization can spread in spite of glaucoma.

In no instance was epithelium found growing on the lens capsule of a normal lens. One of us (A. S.), impressed by the frequency of secondary-cataract forma-

tion or lens capsule and lens material in the eye, considered this an important, inexplicable factor in epithelization.

From this study it appears that X ray or radium should be of little value because the epithelium appears to be normal and mature in all cases examined. Case 3 treated unsuccessfully with X ray, tends to bear this out (fig. 21). However, this case can be discounted in the light of Vail's³ report since it was impossible to find out how much and what type of X-ray therapy was given. One should bear in mind the other treatments suggested by various observers; such as steam cautery,¹¹ chemical irritants injected into the cyst,¹² and diathermy.¹²

EXPERIMENTAL WORK

Attempts to produce epithelization within the eye in operations on 30 laboratory animals have been successful in 12 instances.* Five different types of operations have been done and successes have been obtained in four types. Insufficient experiments have been done to reach any definite conclusion concerning the best method of obtaining successful results or the minimum essential criteria that must be present. Epithelization on the back of the cornea occurred when the endothelium was destroyed (fig. 18). Epithelium did grow along a stitch deep into the cornea but it did not reach the anterior chamber (fig. 6). Maintenance of hypotony did not appear essential to the growth of epithelium and carrying sufficient nutrition with the flap was not invariably necessary.

It is hoped that a continuation of this work will demonstrate conclusively what factors are necessary and provide opportunity to determine experimentally the most effective method of treatment.

* Details of these experiments will be reported later.

PREVENTIVE MEASURES

How can epithelization be prevented? Until the relative importance of all factors concerned is definitely known this question cannot be finally answered. In the light of the knowledge gained from the literature and from this study, it seems plausible that the following precautions should be taken:

1. Use sharp, smooth instruments in opening the eye.
2. Do not traumatize the iris or the back of the cornea with instruments or by irrigation.
3. Avoid ragged cuts through the conjunctiva when making cataract sections.
4. Stitch the wound together, but avoid placing the stitches deeply enough to be extremely near the chamber.
5. Remove the stitches as soon as possible.
6. Remove or replace prolapsed iris promptly.

SUMMARY

Epithelization is a very rare complication of perforations of the eye. Epithelium can be introduced by implantation, by infolding of a flap, or growth along the edge of a perforation. It was found in one case under a trephining flap. It tends to grow along stitches. The epithelization must lodge in a "fertile soil." It has followed a discission.

Mechanical barriers are responsible for cyst formation. Cysts contain pseudo-cholesteatomatous debris from desquamation of surface epithelium. The growth of epithelium to form a cyst may surround phagocytes already present. The final appearance resembles that of an old hypopyon as seen in microscopic sections.

The presence of chemical barriers or toxins is postulated. They can arise from the epithelium itself, from stagnation of the aqueous, or may even be present in normal aqueous. Lack of nutrition is considered as a barrier to epithelization.

Hypotony alone is not a necessary

factor for epithelization to occur although it may favor more rapid spread from absence of pressure or better nutrition in the form of plasmoid aqueous. Increased intraocular pressure does not prevent the spread of epithelization.

From the study of specimens it is not evident why the X ray should be of no therapeutic value because the aberrant epithelium appears quite mature.

CONCLUSIONS

1. Accidental perforation is more prone to be complicated by epithelization than operative perforation. The presence of prolapsed material favors extension of epithelium into the eye by proliferation. In adult life, epithelization is more fre-

quent in males than in females.

2. Endothelium on the back of the cornea is a barrier to the growth of epithelization. However, structures derived from neural ectoderm (iris pigment epithelium, ciliary epithelium, and retina) are not barriers.

3. The gray line seen clinically, marking the delineation of growth, is interpreted as a piling-up of epithelium at the growing edge.

4. Glaucoma does not invariably result from epithelization. When glaucoma is produced, the epithelium grows over the iris-angle meshwork or may block it by cells or parts of cells exfoliated into the aqueous.

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DISCUSSION

DR. DERRICK VAIL (Cincinnati, Ohio): Was there any difference in the histologic picture in the case treated by X ray from that in the others?

DR. T. L. TERRY: Not that we were able to discern. We found the same changes that were presented in other eyes. The epithelium seemed quite healthy and vigorous. We are not sure how much X ray was given, a weak point in showing this case.

DR. PARKER HEATH (Detroit, Mich.): Have you noted sources of epithelium other than conjunctiva and cornea?

DR. T. L. TERRY: In our work, none at all. In the literature there is the statement that hair follicles are found in the anterior chamber. Of course, there is a large amount of work reported in the literature concerning the grafting of all sorts of tissue within the eye. I omitted that from the reading of the paper because our time was getting short, but one person attempted to put all sorts of tissue in the eye, and he found that in 75 percent of the cases, where he had put in fat, placenta, cornea, retina, ovary, liver, spleen, bone, and other tissue, the tissue disap-

peared. Yet there has been a very considerable amount of work in which material has been grafted into the eye by free transplant, just a piece dropped in. Usually, that is done by people who are not ophthalmologists, but who are interested more in ovarian function or endometrium. This material almost invariably gains vascularization from the iris, so we are unable to ascertain the effect of aqueous on it.

Ovarian tissue that was put in gave rise to no function until the female animals were castrated, and then this ovarian tissue took on function. Attempts were made to fertilize matured ova but without success. Fertilized ova that had been washed out of the genitalia could not be made to develop in the anterior chamber. Implanted endometrium showed blushing and blanching phenomena, which can be stimulated by certain internal secretions by cutting the spinal cord and by other methods, and also the usual cycle of endometrium changes typical of ovulation.

DR. CLYDE A. CLAPP (Baltimore, Md.): I would like to ask the author three questions.

First, can he clinically differentiate between epithelization of the anterior chamber and an inflammatory membrane?

Second, what becomes of the endothelium cells on the posterior surface of the cornea when epithelization takes place?

Third, why are glaucoma operations unsuccessful in cases of epithelization?

DR. T. L. TERRY: Usually, the first evidence we have that epithelization has occurred is from microscopic examination of the pathological specimen. Some five cases were diagnosed clinically. The clinical picture is by no means definite. Dr. Verhoeff told me recently of an eye enucleated with the clinical diagnosis of epithelization in which there was *no* evidence of aberrant epithelium present on micro-

scopic examination. He did not say what gave the clinical picture of epithelization. No doubt a thin film of exudate or a disease of the endothelium or dislocation of Descemet's membrane might give the same clinical picture.

DR. CLYDE A. CLAPP: Can you differentiate microscopically?

DR. T. L. TERRY: From a microscopic study of a section, the differentiation can be made.

The epithelization does not grow where there is endothelium. We are unable to say exactly what happens to the endothelium. We feel that the endothelium is destroyed as the epithelium slowly advances, and that the epithelium advances slowly because the endothelium present acts as a mechanical barrier. We know that epithelium grows more rapidly under normal conditions than endothelium, and if the epithelium is desquamating, giving off certain toxins, it is quite possible that that material, in itself, may be toxic to the endothelium.

I do not feel that glaucoma is responsible for the death of the endothelium, rather that trauma of surgery may be an important factor in its destruction. The introduction of an irrigator tip, an iris reposer, or various instruments may scrape and injure the back of the cornea. Where no cataract is present, an attempt is made to keep instruments close to the back of the cornea for fear of producing a cataract. This endangers the endothelium. How the endothelium disappears, I don't know.

The epithelium does not fill the angle in most instances where glaucoma is present. The glaucoma seems to result from a blockage of the iris angle, and we have reason to believe it is due to blockage by desquamating epithelium in the form of particulate matter. The debris would ordinarily produce pseudo-cholesteatoma-

tous material in an epithelial cyst. Similarly some observers feel that exfoliated capsule material as particulate matter may produce certain changes at the iris angle.

DR. CLYDE A. CLAPP: Why doesn't operation cure these cases of glaucoma, if not due to epithelization? You can operate and keep on operating, and still the tension stays up.

DR. T. L. TERRY: Where epithelization is present, there is no endothelial covering and not as much protection against fibrosis.

DR. RODMAN IRVINE (Los Angeles, Calif.): Do blood vessels always accompany the epithelium?

DR. T. L. TERRY: May I ask, in relation to the epithelium or in relation to other parts?

DR. RODMAN IRVINE: Is the growing epithelium always accompanied by blood vessels?

DR. T. L. TERRY: We do not usually find blood vessels in the cornea in the microscopic specimens. One criterion, that a great many people stress, is that epithelization on the back of the cornea will cause vascularization of the cornea. We have not observed vascularization on the specimens studied.

In one of the experimental cases—a slide I did not show—an epithelial cyst was produced, and the back surface of the epithelial cyst was covered with vascularized scar tissue, the blood supply coming from the iris. It seems as though the epithelium grows so much better if it is growing on a structure that does have good nutrition. It grows much better on the iris than on the back of the cornea. It grows on the back of the cornea better than it does on the thin scar-tissue membrane separating it from aqueous in instances where cysts are formed.

A STUDY OF METHEMOGLOBIN-PRODUCING ORGANISMS IN OCULAR INFLAMMATIONS*

MAYNARD A. WOOD, M.D.

Iowa City, Iowa

The two microorganisms that are involved in ocular disease and that produce methemoglobin on blood culture media are *Str. viridans* and *D. pneumoniae*. Recently these two bacteria have been more accurately differentiated by observing their cultural and biological characteristics.

The separation of group-IV pneumococci by Cooper and her co-workers¹ into 29 types has aided greatly in the differentiation of *D. pneumoniae* from *Str. viridans*. Heretofore many strains of *Str. viridans* probably were placed in this heterogeneous group, giving a higher incidence of so-called pneumococci in ocular diseases.

The importance of *Str. viridans* in ocular infections has been emphasized by Schmelzer and Eckstein,² who isolated this organism in 9 cases of *ulcus serpens* and in 64 cases of acute conjunctivitis. Berger and associates³ reported an epidemic of 35 cases of acute conjunctivitis apparently due to *Str. viridans*. Newman⁴ recently stressed the importance of this organism in ocular inflammations.

Considerable difference of opinion exists concerning the characteristics that differentiate *D. pneumoniae* from *Str. viridans*. In this problem the principal criteria for distinguishing the two were bile solubility and reaction to type-specific immune antisera. However, additional data were obtained from the microscopic morphology, cultural characteristics upon solid and liquid media, and action upon inulin.

* From the Department of Ophthalmology, College of Medicine, State University of Iowa, Iowa City, Iowa. Part of a study being conducted under a grant from the Proctor Fund. Read before the Association for Research in Ophthalmology in Saint Louis, May 16, 1939.

METHODS

Bacteriologic studies were made on all patients with conjunctival and corneal disease and all pre-operative cases regardless of the condition of the conjunctiva. Cultures were taken with a platinum loop from the lower fornix streaked upon 5-percent blood-agar plates, incubated at 37°C. for 48 hours, and read at 24 and 48-hour intervals. Colonies of *D. pneumoniae* or *Str. viridans* were identified by a circumscribed zone of methemoglobin formation, the so-called green hemolysis. Isolated colonies were likely to be overlooked unless the plate was carefully examined, because these colonies were small and the area of green hemolysis was rather faint. On most culture plates many colonies were observed but on a few only one or two were found. In the latter case isolated colonies were usually located by examining the plate with transmitted light from the upper part of an unshaded window.

Subcultures of the methemoglobin-producing colonies were made in order to obtain pure cultures. All colonies were examined under the dissecting microscope and colony characteristics recorded. Further subcultures were made to test for bile solubility and inulin fermentation. Description of growth upon broth media was made after 24 hours' incubation, Gram and capsule stains** were made, and reaction to specific typing sera and virulence for mice were determined.

Pure cultures were obtained by "fishing" isolated colonies under a dissecting

** The Hucker modification of the Gram stain was used. The capsules were stained by fixing the smear with glacial acetic acid and staining with 1-percent carbol fuchsin.

microscope and making dilution streaks upon 5-percent blood-agar plates.

Bile solubility was determined upon organisms which had grown for 24 hours in 1-percent dextrose meat-infusion broth centrifuged and resuspended in normal saline. Two drops of 10-percent solution of sodium taurocholate were added to 0.5 c.c. of the cloudy saline suspension. If the organisms were soluble in bile there was complete clearing in one to two minutes. If the cloudiness of the suspension was not altered, the organisms were considered to be insoluble in bile.

Typing was done according to the macroscopic agglutination technique used by the late Miss Georgia Cooper⁵ of the Bureau of Laboratories of the New York City Department of Health. The organisms were grown for 18 hours in 1-percent dextrose meat-infusion broth, centrifuged, and resuspended in normal saline. One-half cubic centimeter of the saline suspension was placed in each of 32 tubes, to each of which was added one-half cubic centimeter of specific immune serum* and the tubes were placed in a water bath at 37°C. Agglutination occurred within 30 to 90 minutes and was observed as clumping of the bacteria with eventual settling to the bottom of the tube.

Virulence for mice was determined by the intraperitoneal injection of 0.5 c.c. of an 18-hour broth culture. The animals were observed for one week, and in those which died, postmortem examinations were made as soon as possible after death, cultures were taken from the peritoneum and heart blood, and the recovered pneumococci were typed.

RESULTS

During the period of observation, a

* The antipneumococcic sera in this work were obtained through the late Miss Georgia Cooper, of the Bureau of Laboratories of the New York City Department of Health.

total of 370 methemoglobin-producing organisms were isolated (table 1). Two hundred or 54.5 percent were *Str. viridans* and 170 or 45.5 percent were *D. pneumoniae*.

In general, the colony characteristics of *D. pneumoniae* upon blood agar were

TABLE 1
TOTAL STRAINS

	Strains	Percent
<i>D. pneumoniae</i>	170*	45.5
<i>Str. viridans</i>	200	54.5
Total	370	

* 101 typed consecutively.

divided into three rather distinct morphologic groups, that is, the smooth, the rough, and type III. The first or smooth group (figure 1, a and b) was most common and was characterized by a small, smooth, translucent (0.5 to 0.8 mm.) colony with a well-defined edge and a definite central depression which appeared at approximately 24 hours. The second or rough group (fig. 1, c) was characterized by a larger and thinner colony (0.8 to 1.2 mm.) which was translucent except for punctate, opaque, knob-like protrusions projecting upward from the surface. The most typical was type III (fig. 1, d), formerly called *Str. mucosus capsulatus*; these colonies were large, round, smooth, moist, convex, and measured approximately 2 to 3 millimeters in diameter.

The colony characteristics of *Str. viridans* were divided into two rather distinct morphologic groups quite different from the above. In one group (fig. 2, a and b) the colony was small, round, and opaque with a slightly rough convex surface and well-defined edges, while the other group (fig. 2, c and d) was larger, less opaque, and showed irregular margins and a rough surface with central umbonation.

The growth of *Str. viridans* and *D. pneumoniae* was characteristic on dextrose meat-infusion broth (fig. 3). *D. pneumoniae* produced a diffuse cloudy growth with slight sediment while *Str. viridans* produced either a clumpy or a cotton ball-like growth which settled to the bottom of the tube. Occasionally the latter organism produced a fine flocculent

tures over 24 hours old, there was considerable variation in size with an occasional gram-negative form.

Capsules were found upon all strains. Those of *Str. viridans* (fig. 5, a) appeared to be sheathlike structures enveloping the long chains of organisms, while the capsule of *D. pneumoniae* (fig. 5, b) appeared as halolike structures surrounding the or-

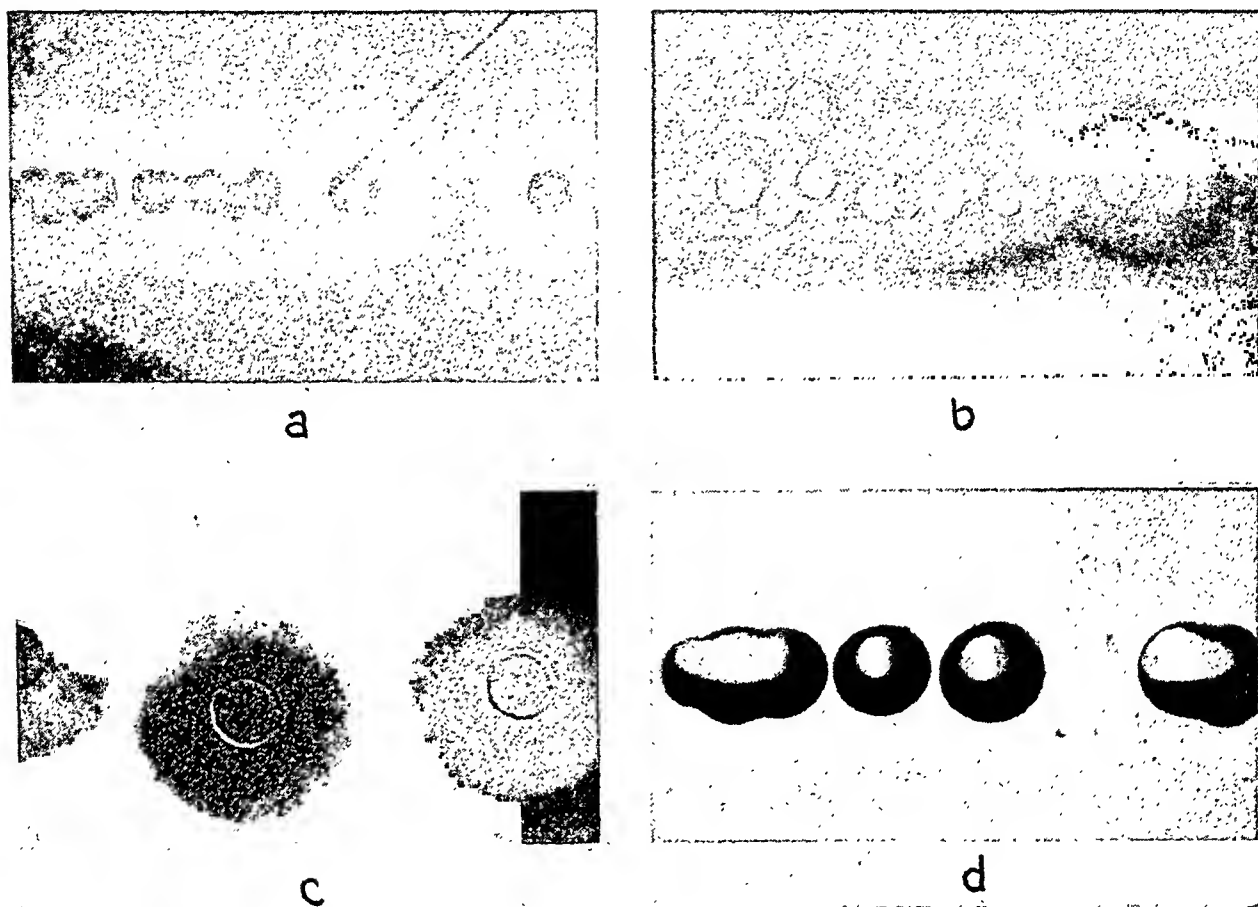


Fig. 1 (Wood). Colony morphology of *D. pneumoniae* on blood agar. a, viewed by transmitted light; b and c, viewed by lateral illumination; d, type III viewed by reflected light.

suspension but even this was distinguishable from the diffuse cloudy growth of *D. pneumoniae*.

Smears of *D. pneumoniae*, taken from 24-hour broth cultures and stained by the Gram method, revealed pairs or short chains (fig. 4, a), while *Str. viridans* usually grew in long chains (fig. 4, b). In young cultures, up to 10 hours old, both were gram-positive, and the individual cocci were uniform in size, while in cul-

ganisms. There was one notable exception; the type-III pneumococcus capsule was similar to that of *Str. viridans* but was much larger.

Bile salts had no action upon *Str. viridans* but dissolved all strains of *D. pneumoniae*.

Inulin fermentation was not found to be of differential significance, as many strains of *D. pneumoniae* either fermented the polysaccharide weakly or not at all,

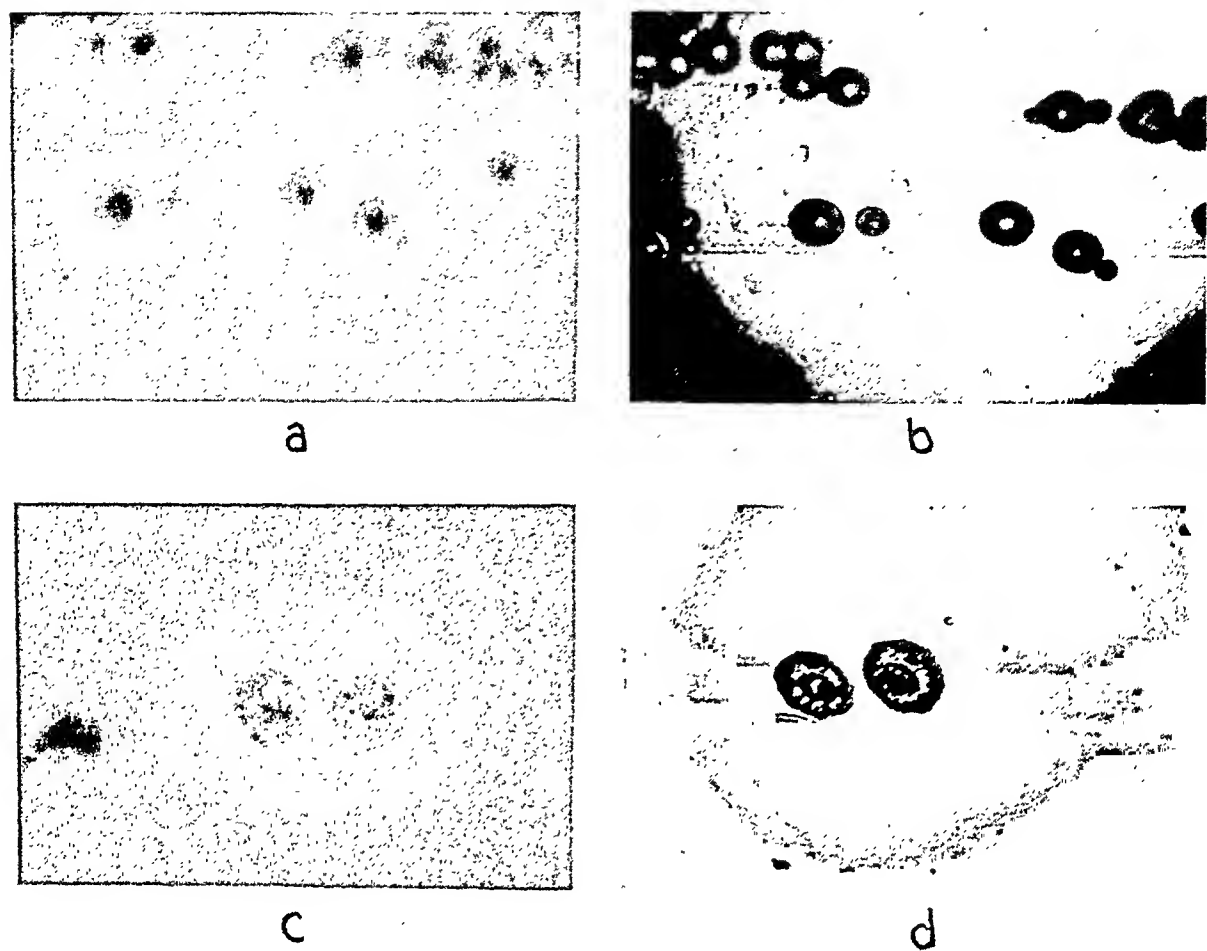


Fig. 2 (Wood). Colony morphology of *Str. viridans* on blood agar. a and c, viewed by transmitted light; b and d, viewed by reflected light.

while 11 percent of those identified as *Str. viridans* produced strong fermentation (table 2).

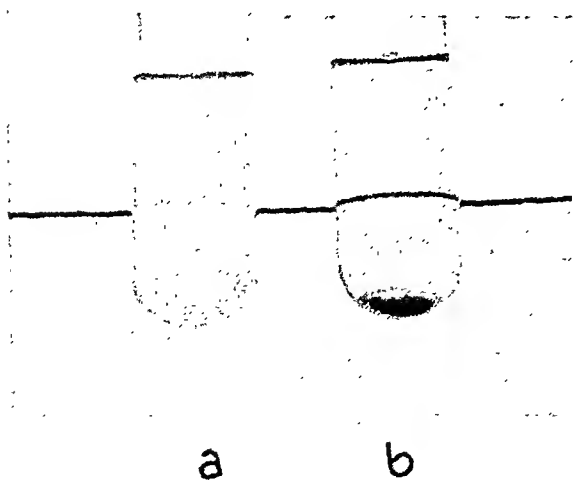


Fig. 3 (Wood). Dextrose meat-infusion broth cultures of: a, *D. pneumoniae* showing diffuse, cloudy growth; b, *Str. viridans* showing sedimentation.

During the early part of this study typing sera were not available but after sera had been obtained 101 consecutive strains were typed (table 3). Type VII was most frequently encountered, occurring in 25 percent of all cases (fig. 6). This was followed in order by type XIV (12 percent), XXIII (10 percent), XIX (6 percent), III, X, XVII (5 percent each), VI, XVIII, XX (each 4 percent), XI, XVI, XXII, XXIX (each 3 percent), XV, XXI (each 2 percent), and V, XXIV, XXV, XXVIII, XXXI (each 1 percent).

TABLE 2
INULIN FERMENTATION

	Strong percent	Weak percent	None percent
<i>D. pneumoniae</i>	33	44	23
<i>Str. viridans</i>	11	40	49

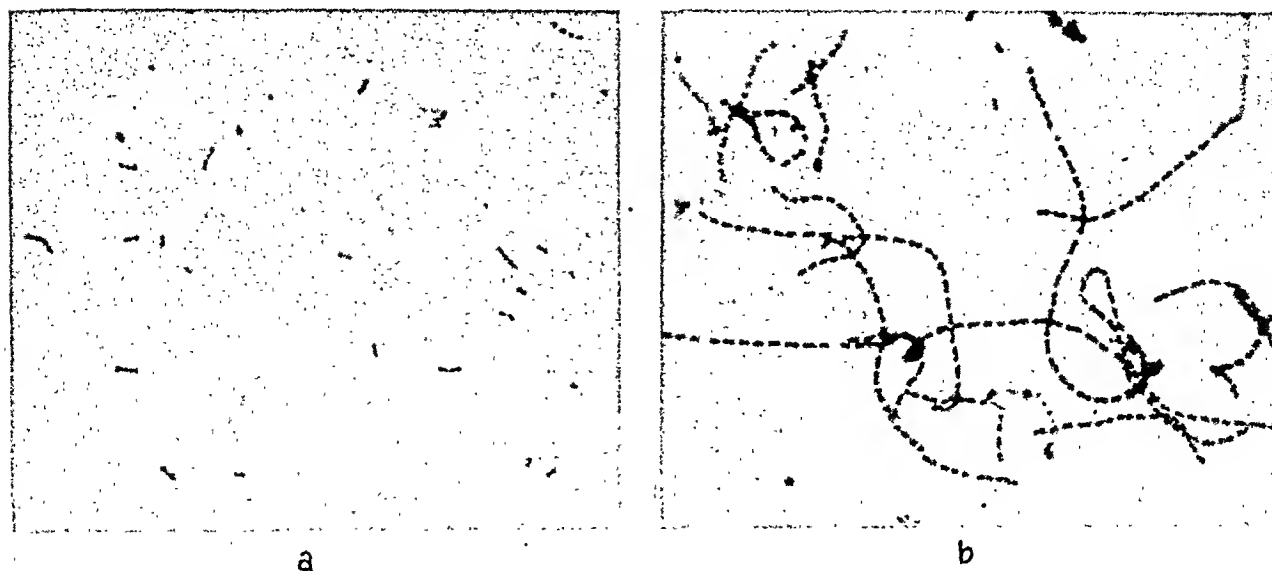


Fig. 4 (Wood). Microscopic morphology after Gram stain. a, *D. pneumoniae*; b, *Str. viridans*.

Eleven types were not represented in this series.

CLINICAL OBSERVATIONS

These organisms were associated with several types of ocular disease which for purposes of simplicity were separated into five main groups: hypopyon ulcer, panophthalmitis, dacryocystitis, orbital abscess, and conjunctivitis. Cases of conjunctivitis were subdivided into catarrhal and special types (table 4).

The microorganisms associated with hypopyon ulcer were studied in 11 cases,

all of which were due to *D. pneumoniae*. In two patients the eye was lost by perforation followed by panophthalmitis. Dacryocystitis was present in eight cases, in six of which there was bilateral infection of the sacs while in two there was unilateral involvement on the side opposite the corneal lesion. In one case the ulcer occurred in the course of an acute conjunctivitis, whereas in the remaining two there was a history of corneal trauma. In those with dacryocystitis, trauma initiated the ulcer in two instances and probably played a contributory role in four,

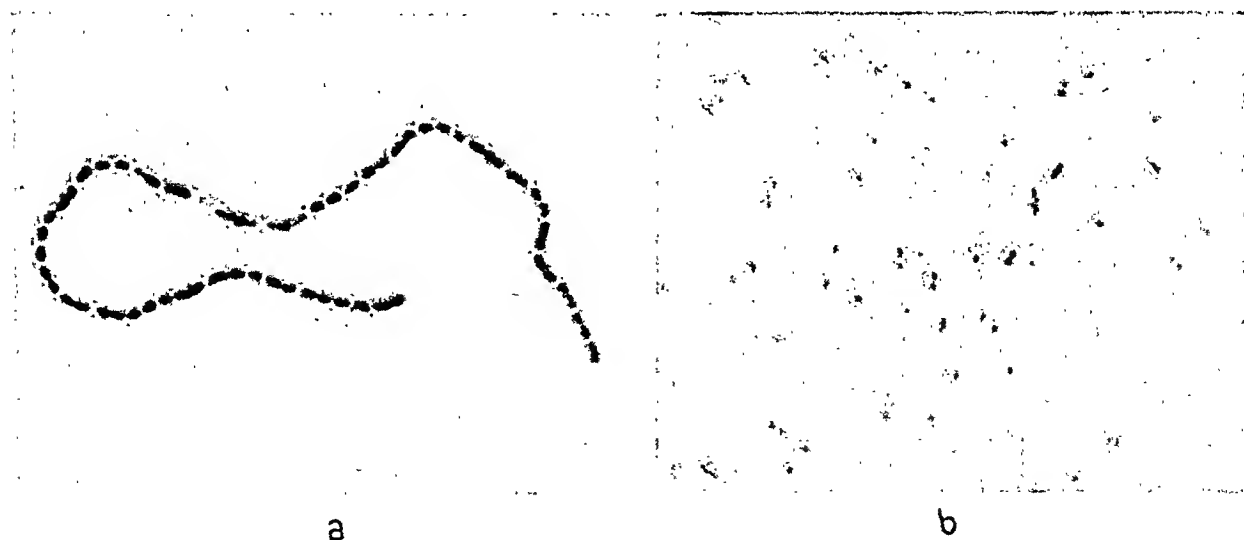


Fig. 5 (Wood). Microscopic morphology after capsule stain. a, *Str. viridans*; b, *D. pneumoniae*.

TABLE 3
INCIDENCE OF TYPES

	III	V	VI	VII	N	XI	XIV	XV	XVI	XVII	XVIII	XIX	XX	XXI	XXII	XXIII	XXIV	XXV	XXVIII	XXIX	XXXI
Normal					1																
Acute conj.	1		1	1	1		5			1		2	1	1	1		1	1	1		1
Sub. conj.				14	1		2														
Chr. conj.	3		3	4	2		1			2		1			2	1				1	
Cornel ulcer	1				1		4		1			1				4					
Acute dacry.								1													
Chronic dacry.						1			1			1									
Panophth.						2															
Trachoma		1		3					1	1	1	1		1						1	

but there was no history of injury in the others.

Five cases of panophthalmitis were observed, in four of which *D. pneumoniae* was the causative organism, with *Str. viridans* as the etiologic agent in the remaining case. One of the pneumococcic cases was a postoperative infection following cataract extraction, although pre-operative cultures were negative for *D. pneumoniae*. One case caused by *D. pneumoniae* followed laceration of the cornea by a flying piece of wood, while two followed perforation of corneal ulcers. The fifth case was one of carcinoma of the lids complicated by a perforating corneal ulcer and panophthalmitis from which *Str. viridans* was isolated.

There were 2 cases of acute dacrocystitis, both of which were due to *D. pneumoniae*, and 17 of chronic dacryocystitis, 5 of which were due to *Str. viridans* and 12 to *D. pneumoniae*.

One case of orbital abscess secondary to an acute ethmoiditis was caused by *Str. viridans*.

There were 79 cases of acute catarrhal conjunctivitis, of which 37 were due to *Str. viridans* and 42 to *D. pneumoniae*. In the 14 cases of subacute conjunctivitis, 7 were caused by *Str. viridans* and 7 by *D. pneumoniae*. In 142 cases of chronic conjunctivitis, 89 were due to *Str. viridans* and 53 to *D. pneumoniae*.

Under the general classification of special forms of conjunctivitis three types were observed. There were 32 cases of trachoma; 19 were secondarily infected with *Str. viridans* and 13 with *D. pneumoniae*. Four cases of conjunctivitis of the newborn were caused by *Str. viridans* and five cases of inclusion blennorrhoea were secondarily infected with the same organism.

Organisms producing methemoglobin were isolated from pre-operative cultures in 58 cases in which the conjunctiva was clinically normal. Thirty-two (55 per-

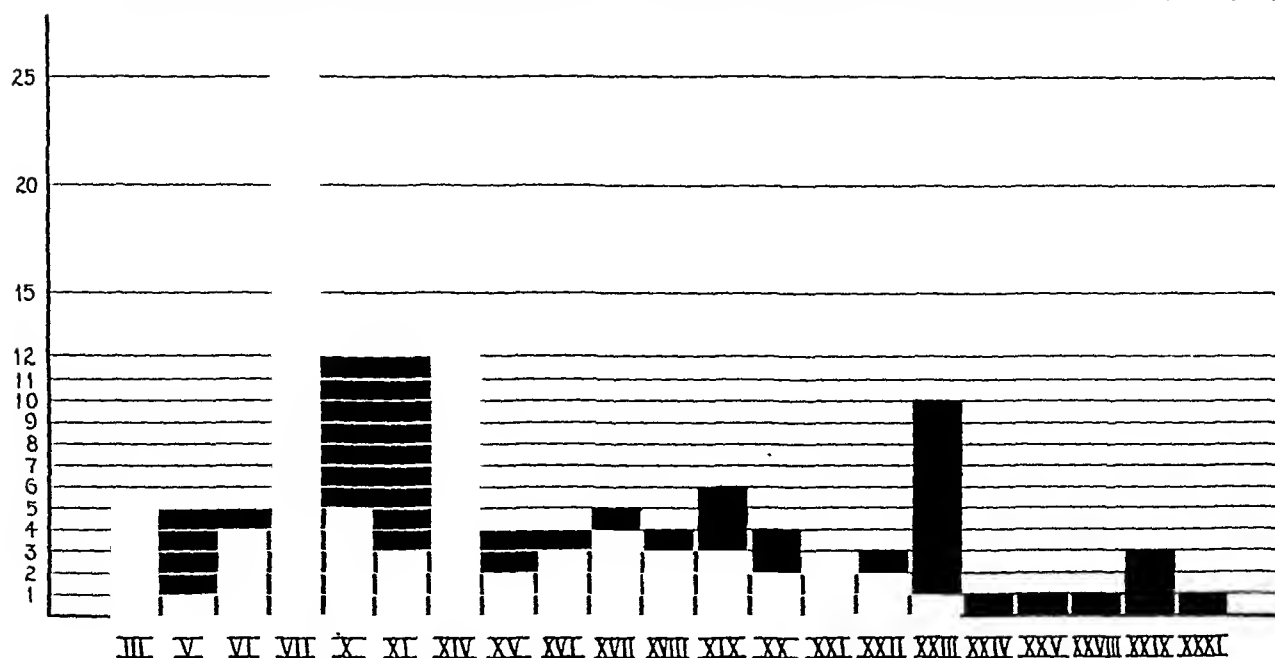


Fig. 6 (Wood). Frequency of types of pneumococci.

cent) were *Str. viridans* and 26 (45 percent) *D. pneumoniae*.

In the majority of the above cases methemoglobin-producing organisms were isolated from the conjunctiva in pure culture or associated with nonpathogenic corynebacteria. However, in a number of instances the hemolytic variety of *Staphylococcus aureus* or *albus* was found.⁸ Hemolytic staphylococci were associated in 4 cases of hypopyon ulcer, in 9 of acute catarrhal conjunctivitis, in 1 of subacute catarrhal conjunctivitis, and in 53 cases of chronic catarrhal conjunctivitis. They occurred 9 times in trachoma, once

in inclusion blennorrhea, 8 times in chronic dacryocystitis, and 5 times in the clinically normal conjunctiva. No other pathogenic organisms were isolated from these lesions.

These organisms were surprisingly avirulent for mice. Mice were not killed by any of the strains of *Str. viridans*, and only an occasional strain of *D. pneumoniae* produced death, but it was not uncommon to observe mice which apparently were quite ill.*

* Recently, 3-hour broth culture of *D. pneumoniae* have proved to be more virulent for mice.

TABLE 4
RELATIVE INCIDENCE OF *STR. VIRIDANS* AND *D. PNEUMONIAE*

Condition	Total No. of Strains	Strep.	Pneumo.
Normal	58	32	26
Corneal ulcer	11	0	11
Panophthalmitis	5	1	4
Acute dacryocystitis	2	0	2
Chronic dacryocystitis	17	5	12
Orbital abscess	1	1	0
Acute catarrhal conj.	79	37	42
Subacute catarrhal conj.	14	7	7
Chronic catarrhal conj.	142	89	53
Trachoma	32	19	13
Inclusion blennorrhea	5	5	0
Conjunctivitis of newborn	4	4	0
Total	370	200	170

DISCUSSION

Reaction to type-specific antisera is at present the only absolute criterion for the diagnosis of *D. pneumoniae*, but there probably are some strains of this organism for which type-specific antisera have not yet been developed. Furthermore, some variants of the 30* specific types do not react to the specific antisera. Numerous characteristics of pneumococci have been used by various authors for the differentiation of this organism from *Str. viridans*. In our laboratory all strains of *D. pneumoniae* that reacted to type-specific antisera were bile soluble. The action upon inulin was not constant; therefore bile solubility was chosen as the more specific distinguishing characteristic. Information obtained from colony characteristics upon blood agar and broth media confirmed the above findings. Thus all the organisms having the colony characteristics of *D. pneumoniae* were soluble in bile whereas very few if any of the strains having colony characteristics of *Str. viridans* were bile soluble.

Kelly⁶ found that the presence of sugar in the medium in which the pneumococcus was grown had an inhibitory effect on the lytic action of bile salts. Such interference was noted during this study, therefore the broth cultures were centrifuged and the organisms were resuspended in normal saline before the test for bile solubility was made.

The relative frequency of *Str. viridans* and *D. pneumoniae* reveals a higher incidence of streptococci in ocular inflammation than is generally conceded. Streptococci were much more frequent in chronic infectious processes while pneumococci were more prevalent in acute lesions; for example, corneal ulcer and panophthalmitis. In acute catarrhal con-

junctivitis the relative frequency of the two organisms was almost the same, but in general *D. pneumoniae* was associated with the more severe infections whereas *Str. viridans* infections tended to be less severe and of shorter duration.

The high incidence of type VII pneumococcus is significant if specific immune sera are to be used in therapy. It is possible that this type was particularly prevalent during the period of observation, but similar results were reported by Newman prior to this study. Further investigation of the types encountered in ocular disease will no doubt confirm or disprove these findings.

There were four consecutive cases of acute catarrhal conjunctivitis due to type VII pneumococcus in which there was a history of contact. All were in male university students, two of whom were roommates and the other two had been in the same room studying for an examination. It is reasonable to assume the infection was transferred by contact in these cases.

The presence of methemoglobin-producing organisms, particularly *D. pneumoniae*, on the clinically normal conjunctiva possibly explains the cause of many postoperative infections of the eye. Pillat⁷ found *D. pneumoniae* growing as a saprophyte in 40 percent of a group of 32 individuals who had no conjunctival inflammation. In this series of cultures, taken from approximately 1,000 patients with clinically normal conjunctivae, *D. pneumoniae* occurred in slightly over 2 percent. In the one case of postoperative infection, *D. pneumoniae* was either present on the conjunctiva but was not found at the time the culture was taken, or the conjunctiva was infected during or immediately following the operation. This was the third postoperative infection in the course of approximately 4,800 major operations in the clinic since routine preoperative cultures have been made.

In several cases the bacteriological and

* Serum XXVI and XXX have been omitted, as the former is probably identical with serum VI and the latter is closely related to, or identical with serum XV.

clinical observations were of interest. In two sisters with congenital blepharophimosis and chronic conjunctivitis, both *D. pneumoniae* and *Str. viridans* were isolated. In three cases of conjunctivitis, two types of *D. pneumoniae* were present at the same time; one was an acute conjunctivitis with types VII and XX, one was a subacute conjunctivitis from which types XIV and XXIII were isolated, and the other was a case of chronic dacryocystitis with types VII and XIX.

In five cases of chronic conjunctivitis, *D. pneumoniae* and *Str. viridans* were cultured from the same patient at intervals of from one to seven months. In another case *Str. viridans* was cultured during an attack of chronic conjunctivitis and *D. pneumoniae* (type XXVIII) during an attack of acute catarrhal conjunctivitis four months later. In an additional case, *Str. viridans*, *D. pneumoniae* (type VII), and *Str. viridans* were isolated on three successive attacks of acute catarrhal conjunctivitis over a period of six months.

Whether or not these cases represent new infections or different forms of the same organism is open to speculation.

CONCLUSIONS

1. The incidence of *Str. viridans* and *D. pneumoniae* in ocular inflammations is quite similar.
2. The criteria for the diagnosis of *D. pneumoniae* in order of importance are:
 - a. Reaction to type-specific antisera
 - b. Bile solubility
 - c. Colony characteristics upon solid and liquid culture media.
 - d. Microscopic characteristics after growth in broth media.
3. Inulin fermentation alone is of no value in differentiating *D. pneumoniae* from *Str. viridans*.
4. In order of frequency among pneumococci, type VII (25 percent) was most common, followed in order by type XIV (12 percent) and type XXIII (10 percent). The remaining types were less frequently encountered.

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DISCUSSION

DR. SANFORD H. GIFFORD (Chicago, Ill.): Out of how many normal conjunctivae were the positive cultures made?

DR. MAYNARD A. WOOD: That represents approximately 1,000 pre-operative

cultures taken routinely on all pre-operative cases, including, of course, operative cataracts, squints, glaucoma cases, and so forth.

HUMAN CYCLOPIA WITH ASSOCIATED OCULAR ANOMALIES*

A CASE REPORT AND EMBRYOLOGICAL INTERPRETATIONS

INEZ E. WILBER, M.D.
New York

Cyclopia, or synophthalmia, has aroused curiosity since earliest times because of its striking appearance. However, no very accurate anatomical descriptions are to be found prior to the

processes leading to the formation of the cyclopic eye has been brought about only recently through the experimental approach by embryologists.

In this paper a typical cyclopic specimen** will be described, its teratogenesis discussed, and the accompanying ocular anomalies interpreted.

CASE HISTORY

The infant was an eight-months premature female of normal size for its age. It lived for one-half hour after birth. The mother was a normal primipara.

Gross findings: The nose was situated in the mid-forehead above the eyes and appeared as a cylindrical protrusion one inch in length (fig. 1). It had a single opening through the center, but the proximal portion did not communicate with the pharynx. In the mid-line below the nose was one orbital opening in which the two eyes were fused. The optic nerve was absent. The brain was incompletely developed, with two buds representing the cerebral hemispheres, a small cerebellum, and a diminutive brain stem.

The fused globes were fixed in formalin, sectioned horizontally, and stained with hematoxylin and eosin.

Microscopic description: The two bulbs, each about one-half normal size for the age of the fetus, were fused slightly mesial to the nasal limbus. From this point a septum composed of conjunctiva, sclera, choroid, and retinal pigment separated the two vitreous cavities for a short distance anteriorly, while



Fig. 1 (Wilber). Cyclopic fetus.

nineteenth century. Since then, many case reports have appeared, but an adequate understanding of the developmental

*From the Department of Ophthalmology, Columbia University, College of Physicians and Surgeons.

**The specimen, with the history and gross findings, was sent to the laboratory by Dr. Charles Rubenstein of Brooklyn, New York.

posteriorly this division was effected by a double fold of retina extending backward to the region of the common optic stalk (fig. 2).

The two corneae showed irregularity of the epithelium, which was two to four

embryonic in type, being filled with uveal trabeculae. The interstices contained some pink-staining material and brown pigment granules which appeared to have migrated from the outer layer of the pars ciliaris retinae. The two canals

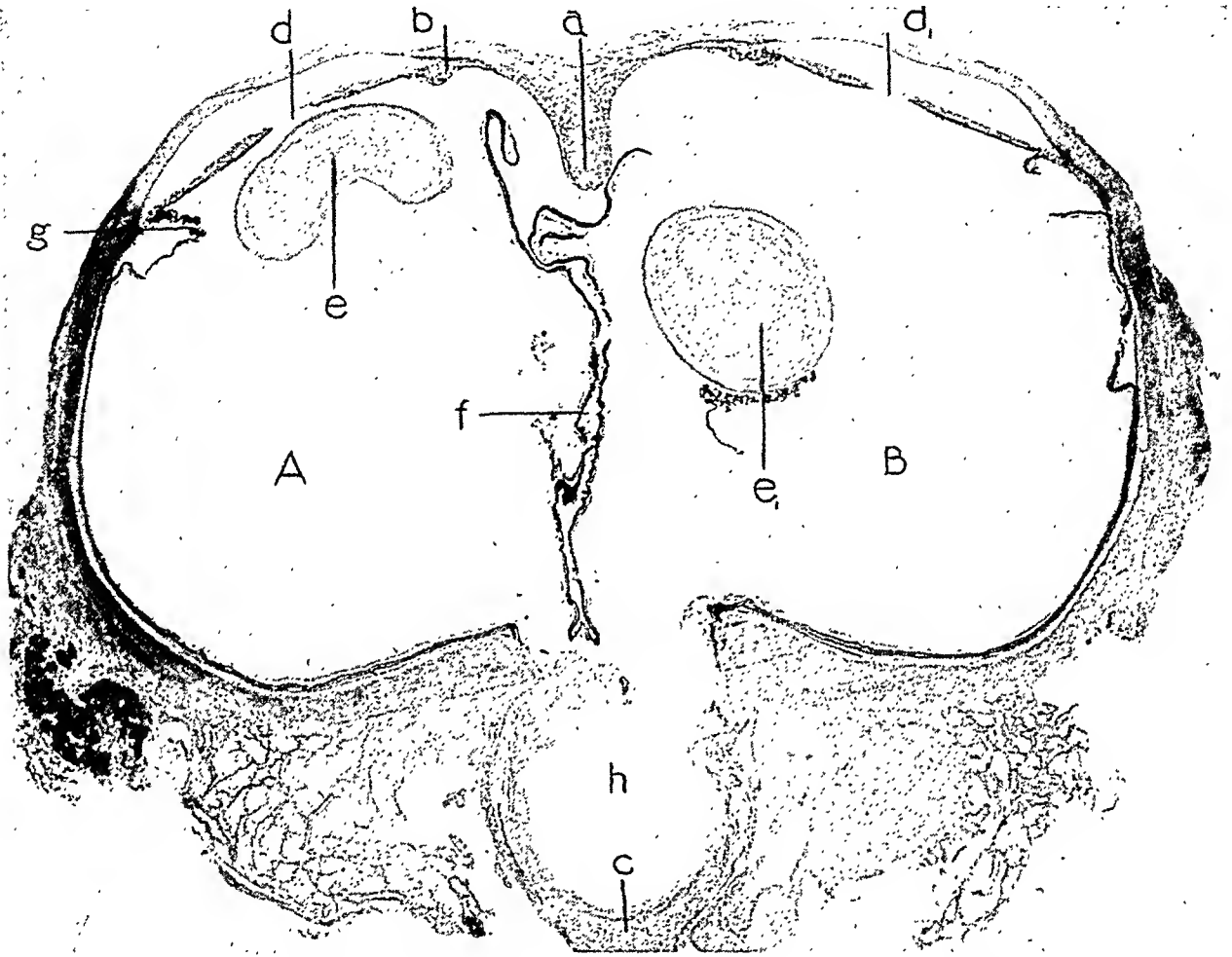


Fig. 2 (Wilber). Horizontal section through the fused bulbs. A, B, vitreous cavities; a, scleral septum; b, ciliary body; c, optic stalk; d, d₁, persistent pupillary membranes; e, e₁, lenses; f, retinal septum; g, ciliary processes; h, coloboma of the optic nerve.

cells in thickness. The structure of the substantia propria was also irregular and more than normally cellular. (These findings may, however, have been artefacts produced during fixation.) Over the endothelium were scattered precipitates of a fine dustlike brown pigment and pink-staining debris. Anteriorly, the sclera was not remarkable, but posteriorly it appeared thin and less well developed. The two anterior chambers were fairly shallow, and their filtration angles were

of Schlemm were filled with red blood cells and lay posterior to the chamber angles.

The irides were embryonic in type, particularly on the nasal sides where they were quite short. Near the chamber angles the anterior border layer was overlaid by strands of uveal trabeculae and elsewhere by pink-staining material. The iris stroma was composed of a vascular network of small and medium-sized blood vessels with little cellular structure be-

tween and no pigment-bearing cells. There was a separation of the inner and outer layers of the pars iridis retinae which in some places was complete. The sphincter iridis muscles were well developed while the dilator muscles were absent. Extending across the pupillary areas from the temporal to the nasal angular line (*circulus minor venosus*), were well-developed pupillary membranes, all the vessels of which were filled with red blood cells. The ciliary bodies were poorly developed, the muscular layers being thin and flat, although the processes were comparatively large and numerous, particularly on the temporal sides.

The choroidal vessels, whenever present, were engorged. The suprachoroidea was underdeveloped and merged into the sclera in many places. No pigment-bearing cells were recognizable as such. The retinal pigment epithelium was thick and redundant in some places but missing in others. Wherever this layer failed there was a corresponding absence of the choriocapillaris, and here also the entire choroid seemed poorly demarcated from the sclera.

The retina began far forward on the corona ciliaris. All the layers were discernible, but in the nerve-fiber layer no nerve fibers were seen, only Müller's supporting fibers being identified. The ganglion-cell layer and the layer of rods and cones were poorly developed. The retinal blood vessels were located immediately under the internal limiting membrane. Near the optic stalk and in the portion which formed the septum between the fused eyes the retina showed many folds and rosettes. The latter were oval as well as tubelike in shape and were made up of the inner retinal layers. One of the eyes exhibited a large macular coloboma manifested by a complete absence of pigment epithelium and choroid. This region was bridged by rudi-

mentary retinal tissue in which the various layers were not represented. In the other eye the macular area showed poor development.

At the posterior pole was a coloboma of the optic nerve surrounded by a well-developed sheath. In this region the choroidal and epithelial pigment layers were lacking, although some rudimentary retinal tissue was seen. In some sections a cone of glial connective tissue appeared protruding anterior to the coloboma.

Each eye possessed its own lens. One of these resembled a concave disc with its concavity directed posteriorly, while the other had a spherical shape. In the central region of the latter were areas of calcification. Both lenses appeared to be luxated, the former forward and nasally, the latter backward and nasally. This may have been an artefact produced during preparation of the specimen. Well-developed remnants of the tunica vasculosa lentis were seen posterior to both. In many places the ciliary processes were found to be adherent to the lens capsule. The vitreous was shrunken and contained a moderate number of cells which resembled mononuclear cells, round cells, and retinal elements.

Lacrimal-gland tissue was located behind the bulb, while extraocular muscles were found laterally and posteriorly.

INTERPRETATION

The morphology of the above-described case is similar to most of the cyclopic eyes so far reported.¹ The small proboscis, with single nasal chamber that fails to communicate with the pharynx, malformation of the brain, and accompanying ocular anomalies are all present.

The total size of the fused eyes is seen to equal that of one normal eye. Each bulb, taken alone, is microphthalmic. There is an accompanying microcornea as well as a cornea plana, with the curva-

ture approximately the same as that of the sclera. This is considered to represent an arrest of development of this portion of the eye at the fourth month of fetal life. The irregular arrangement of the cells of the substantia propria is probably caused by an imperfect differentiation of the mesoderm.

It is also apparent that the sclera is thinner posteriorly than anteriorly. This is a finding that indicates an arrest of development at about the fifth month of prenatal life, since the condensation of the mesoderm surrounding the optic vesicles to differentiate the sclerotic is completed earlier in the anterior segment than in the posterior segment. The anterior chambers have been described as embryonic in type because the normal amount of mesodermal atrophy has not yet taken place and the canals of Schlemm are still well in front of the angles. At the eighth-month stage they should be posterior.

The presence of pupillary membranes in this eight-months-old fetus is a normal finding, since atrophy is usually not complete until 8½ months. Inasmuch as the pigment develops after birth, its absence in this case has no significance. However, failure of the dilator pupillae iridis muscles indicates an arrest of development of this part at the sixth month, the time at which this muscle forms. Also, the inner and outer layers of the pars iridis retinae, although normally separated at five months, should at seven months have become adherent.

The ciliary bodies show normal formation for the age of eight months. The ciliary processes, however, are still adherent in many places to the lens capsule. Although this is a normal state at five months, according to Mann,² its persistence causes an irregular development of the zonular fibers and results in an abnormality of the shape of the lens as well as its dislocation. In this case, then, we as-

sume that the disc shape of one lens, as well as the apparent luxation of both lenses, may be attributed to irregular growth and weakness of the zonular fibers, and is therefore an arrest occurring at the fifth month. Posterior to the lens capsules are seen blood vessels of the tunica vasculosa lentis that represent remains of the embryonic hyaloid vascular systems. This is not a remarkable finding at eight months, as these rarely undergo atrophy before 8½ months and remnants may persist to a variable extent throughout life.

The choroidal net always forms wherever retinal pigment epithelium and mesoderm come in contact but fails wherever the pigment epithelium is absent. This is the explanation for the frequent fading of choroid and sclera and for the macular coloboma seen in one of the eyes. The macular area of the other eye cannot be differentiated.

The retinal blood vessels are located beneath the internal limiting membrane, a result of secondary degeneration at about the 28-mm. stage. The other retinal layers are identified but in many places poorly demarcated. This is particularly true of the rods and cones, which, comprising the most highly specialized layer of cells of the retina, undergo greatest development during the ninth month of fetal life. The rosettes noted in the posterior pole and in the septumlike folds between the eyes are composed of retinal elements of the inner and outer nuclear layers. They are a transitory normal finding at the 15-mm. stage and are caused by the fact that the inner layers of the optic cup grow more rapidly than the outer layers, so that the inner layers are thrown up into folds, puckers, and rosettes. They are almost always present in microphthalmic eyes.

The visual pathway should be complete by the seventh month, but here

there is an absence of nerve fibers and imperfectly developed ganglion cells. This is due to secondary degeneration caused by an antenatal pathological process. Such an absence is frequently noted in anencephalic fetuses. The coloboma of the optic nerve may be attributed to incomplete closure of the fetal cleft at the 20-mm. stage, due in turn to an excessive eversion of the inner layers of the optic cup at that time. Approaching the region normally occupied by the optic nerve there is on all sides a complete failure of the choroid and pigment epithelium. The retina continues as a faintly staining, poorly differentiated membrane and in places is thrown into rosettes and folds. The cone of glial connective tissue present anterior to the coloboma bears the name of Bergmeister's papilla, which normally undergoes atrophy to a variable extent to form the so-called cupping of the optic disc.

DISCUSSION

Seefelder³ defines cyclopia as a defect in formation involving the brain and skull sections between the two eyes and in part or entirely the eye itself. It is an abnormality that exhibits a characteristic deviation from the normal pattern in all vertebrates.⁴ So far, no reliable figures regarding the incidence of cyclopia are available. It is not inheritable because it is nonviable, but Klopstock⁵ has observed a familial occurrence.

Cyclopia has been produced experimentally in a variety of animals and by different methods. Dareste (1877)⁶ and Féré (1900)⁷ subjected chick eggs to high temperatures, while Kellicott (1916)⁸ and Loeb (1915)⁹ treated *Fundulus* eggs to low ones. Born (1897)¹⁰ caused synophthalmia by splitting frog eggs in the mid-sagittal plane. Stockard (1909)¹¹ reported cyclopia occurring in a large percentage of teleost embryos when they

were allowed to develop in sea water containing an excess of magnesium chloride. He found that the best results were obtained when the eggs were placed in the solution immediately after fertilization, whereas if 15 hours were allowed to elapse between fertilization and immersion in the solution no cyclopia resulted. The most effective time for exposure was found to be between the 8- and 32-cell stages, before the germ ring had formed. Speman (1901)¹² produced cyclopia by ligating Triton eggs in the mid-sagittal plane during early segmentation. Lewis (1909)¹³ obtained the same response by pricking the extreme anterior end of the embryonic shield of *Fundulus* eggs, and Mangold (1931)¹⁴ did so by excising the prechordal portion of the roof of the archenteron.

From the evidence to date it would appear that there is no single specific agent responsible for the production of cyclopia, but that it is due to a variety of influences in the embryo's environment causing a graded series of abnormalities depending upon the severity of their action, the age of the embryo at the time they act, and the individual embryo's amount of resistance.⁴ Stockard¹¹ believes that the embryonic tissue that is undergoing the most rapid development at the time is the one most severely affected. According to experiments conducted by Adelman the abnormality is produced when the mesodermal substrate or form-determining influences are impaired.

That there is but a single eye anlage seems to have been definitely established. This point has been contended for many years, beginning with Speer (1817)¹⁵ and Meckel (1826)¹⁶ who believed that cyclopia was brought about by the joining of two separate and distinct anlagen. Huschke (1832)¹⁷ thought it to be due to an incomplete separation of primarily fused ocular anlagen. The subsequent in-

vestigators supported one or the other point of view.

The eye primordium is located in the dorsal lip of the blastopore in the earliest stages of gastrulation; that is, before the 2-mm. stage of development.¹⁸ Since this region is the first part to invaginate, it comes to lie in the roof of the archenteron under the anterior end of the prospective neural plate. Then, under the influence of the archenteron, the eye-field next comes to occupy the median one third of the anterior neural plate. While still in the gastrula stage, the neural plate induces the underlying mesodermal substrate to exert its influence to effect a division of the eye material antero-medially by tissue that is probably the primordium of the lamina terminalis, and connected posteriorly by the primitive chiasm. The end result, according to Mangold, is a product of the reaction of the neural plate and the mesodermal substrate.

There is, however, according to Adelman, a potential continuity of mesoderm across the mid-line in the prechordal region, for the prechordal mesoderm later separates from the roof of the archenteron, and this median portion expands laterally, ultimately forming bilateral masses that come to lie dorsal and caudal to the eye and furnish material for some

of the ocular muscles and at least a part of the mesenchyme of the head. On either side of the median prechordal-plate mesoderm is the lateral prechordal mesoderm that is to form the mandibular arches. Thus, because of its arrangement, the mesodermal substrate, or entomesoderm, exhibits a bilateral disposition of its parts.

In cyclopia, there is a continuity of mesoderm across the mid-line with no division into median prechordal plate and bilateral mandibular portions. The entomesoderm underlying the neural plate fails to stimulate bilateral differentiation of two eyes and there is instead an atypical differentiation.⁴

SUMMARY

A case of cyclopia, type synophthalmia bilentica, with concurrent ocular anomalies has been described and its embryological development delineated. Modern theories of the teratogenesis of cyclopia have been discussed.

I wish to express my gratitude to Dr. Algernon B. Reese for his permission to publish this case and for his assistance and advice, and to extend acknowledgment to Miss Lilly Knieske and Mr. Nicholas Ross for their part in the histological preparation of the specimen.

312 East Sixty-sixth Street.

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IRRIGATIONS WITH SULFANILAMIDE AS A TREATMENT FOR GONORRHEAL CONJUNCTIVITIS

A REPORT OF FIFTEEN CASES*

WALTER J. REIN, M.D. AND O. B. TIBBETTS, M.D.
Richmond, Virginia

Since the adoption of the Credé method for the prophylaxis of gonorrheal ophthalmia there has been a feeling among the medical profession at large that this disease has become relatively rare. That this is in error is shown by records of the Medical College of Virginia, where 35 cases have been hospitalized during the past two years. It is also felt that the occurrence of the condition may be due in some cases to the substitution by accoucheurs of organic silver preparations for silver-nitrate solution, as recommended by Credé.

Because of our knowledge of the frequency of this disease we have been on the alert for a safe, simple, effective

treatment. Anything to better the treatment helps to solve a serious economic situation in hospitals, and offers, as well, advantages to the patient from a therapeutic standpoint.

The development of the use of sulfanilamide in the treatment of gonorrheal ophthalmia is of relatively recent occurrence. Formerly, the treatment of gonorrheal ophthalmia was usually a long-drawn-out affair, the end-results often being enucleation or, at best, badly scarred corneae in adults. For the past year we have been treating all cases of gonorrheal ophthalmia locally with sulfanilamide irrigations, with very good results. Inasmuch as many cases of gonorrheal ophthalmia occur in the newborn and infants, we feel that this type of therapy is a step forward. In our ex-

* From the Department of Ophthalmology, Medical College of Virginia, Richmond, Virginia.

perience there has never been observed the slightest evidence of systemic reaction.

Newman¹ reported a series of eight cases in children up to the age of 12 years treated with sulfanilamide orally. Perry² reported one case in an 11-year-old girl with corneal ulcer treated with sulfanilamide by mouth and the Kettering Hypertherm. Magitot³ and others reported five cases (three newborn, one infant, and one adult) treated with sulfanilamide by mouth, and stressed the necessity of continuous treatment for two weeks to prevent a relapse. They also used potassium permanganate douches locally to the eyes. Dollfus⁴ and his co-workers reported a series of seven cases (three adults and four newborn) treated with sulfanilamide by mouth. Pages and Duguet⁵ reported three cases in adults treated with sulfanilamide orally and protargol locally. All of these cases were cured with no visual impairment. Brewster⁶ found that patients recovered in an average of 10.4 days when given sulfanilamide by mouth, this treatment being supplemented with milk or typhoid injections and 10-percent argyrol dropped into the eyes.

A year ago one of us (W.J.R.) thought of the possible local use of sulfanilamide in gonorrheal infections of the eye. At that time nothing was known of the effect of this new drug applied to the delicate corneal tissues. Accordingly, a saturated solution (0.8-percent) of the drug was prepared and the eyes of several dogs were irrigated several times daily with the solution. After 10 days the only change noted in the dogs' eyes was the disappearance of any incidental conjunctivitis. It was then deemed safe to use cautiously a preparation of 0.5-percent solution in the human eye.

Previous to this time in the routine treatment of gonorrheal ophthalmia we

had followed the general lines recommended by many authorities such as Duke-Elder,⁷ Parsons,⁸ and others, consisting of frequent local irrigations with boric-acid solution, the use of some silver preparation, constitutional support, and treatment of any complications such as urethritis, vaginitis, or arthritis, as best we could. Under this regimen some of the most intractable cases lasted up to eight months with continuous hospital care.

METHOD OF TREATMENT

In all cases when conjunctivitis is seen in the out-patient department or in the emergency room, an immediate smear is made, and the slide is sent to the bacteriology laboratory. If gram-negative intracellular diplococci are found the case is classed as gonorrheal ophthalmia, and the patient is immediately admitted to the hospital and provided with special nurses. If the infection is found to be unilateral the uninvolved eye is covered with a Buller shield. It is the duty of the special nurse to irrigate the infected eye or eyes every 15 minutes, night and day, with a 0.5-percent solution of sulfanilamide made up in normal saline solution. The amount of solution used in the irrigations varied, but sufficient to keep the eyes clean was consistently administered. In cases with other gonorrheal complications—for example, vaginitis or urethritis—a supplementary dose of sulfanilamide, 30 to 60 grains (2 to 4 gm.), is usually given orally, according to the age and weight of the patient. At the end of 24 hours a remarkable change has usually occurred. The cornea is cleaner and brighter, secretion of pus has almost stopped, edema of the lids is rapidly receding, and, in those cases with complication of corneal ulcer, the lesion has advanced no farther or has begun to heal. Smears are taken daily from the conjunctival sac, and the patient is discharged

TABLE 1
CASES TREATED BY EARLIER METHOD

Case No.	Age	Color	Sex	Complications	Duration before hospitalization	Days before negative smear
1	2 yrs.	C.	M.	—	—	18
2*	3 wks.	C.	M.	—	4 days	31
3	3 wks.	C.	M.	—	7 days	40
4	4 wks.	C.	M.	—	O.D. 15 days O.S. 20 days	14 17
5	6 days	C.	F.	—	—	O.D. 30 O.S. 31
6	3 wks.	C.	F.	—	O.D. 14 days O.S. 14 days	12 12
7	Newborn	W.	M.	—	—	O.U. 106
8	21 mos.	C.	M.	—	O.U. 3 days	21
9	21 yrs.	W.	M.	Urethritis Arthritis	7 days	17
10	1 yr.	C.	F.	—	10 days	7
11	5 wks.	C.	M.	—	—	O.U. 19
12	3 yrs.	C.	F.	—	3 days	13
13†	13 yrs.	C.	M.	Ulcer, with perforation	—	O.U. 13
14	3 wks.	W.	F.	—	—	45
15	22 yrs.	C.	M.	Urethritis Arthritis	2 days	22

* This patient was prematurely born.
† Enucleation of the right eye was performed at a later date in this case.

when three consecutive daily smears show the absence of intra- or extracellular diplococci. To date we have had no relapses. The following tables show a comparison of the last 15 cases under our supervision treated in the earlier manner with the 15 affording the material for our present subject.

COMMENT
The patients were predominantly colored. Many were kept hospitalized for a variable time without treatment after being pronounced cured to assure better care in the event of a relapse of the ocular condition or for continued treatment of a gonorrheal complication. The

TABLE 2
CASES TREATED WITH SULFANILAMDE-SOLUTION IRRIGATIONS

Case No.	Age	Color	Sex	Complications	Duration before hospitalization	Days before negative smear
16	2 yrs.	W.	F.	Vaginitis	4 days	2
17	4 days	C.	F.	—	3 days	10
18	7 days	C.	M.	—	?	12
19	4 days	C.	M.	—	2 days	8
20	4 yrs.	C.	F.	Corneal ulcer Vaginitis	7 days	3
21	14 days	C.	M.	—	12 days	14
22	21 yrs.	C.	M.	Urethritis	5 days	1
23	2 yrs.	C.	F.	Corneal ulcer	7 days	2
24	Newborn	C.	M.	—	1 day	7
25	38 yrs.	C.	M.	Urethritis	21 days	1 (No positive smears found)
26	4 days	C.	F.	—	1 day	13
27	5 yrs.	C.	F.	—	—	18
28	2 yrs.	W.	F.	Vaginitis	7 days	2
29	7 days	C.	F.	—	7 days	2
30	Newborn	C.	F.	—	1 day	7

period of treatment of cases through no. 15 was 408 days before a negative smear was obtained, an average of 27.2 days; of cases 16 through 30 it was 102 days, an average of 6.8 days.

Due regard for signs of toxic reactions, such as cyanosis of the lips, skin rash, jaundice, mental depression, changes in blood-cell counts, was maintained, but never observed in our series of 15 cases.

The treatment was not abetted by additional therapy such as silver solutions, foreign-protein injections, thermotherapy, or the like; the patients were given only adequate balanced meals and general care, together with attention to any complications present.

SUMMARY

1. A series of 15 cases of gonorrheal ophthalmia have been reported. We believe a new technique in the local use of sulfanilamide has been advanced.

2. We feel that the local use of sulfanilamide in solution in the treatment of gonorrheal ophthalmia practically eliminates the danger of systemic reactions.

3. In our series of 15 cases of gonorrheal ophthalmia treated locally with sulfanilamide there have been no ocular complications.

4. The economic advantages, by reason of the reduction of the period of hospitalization to less than one third that required by use of other standard measures, are obvious.

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SNAKE VENOM IN OPHTHALMOLOGY*

MOACYR E. ALVARO, M.D.

São Paulo, Brazil

Among the 2,300 more or less known species of serpents, approximately 390 are called "poisonous" in the literal sense of the word ("serpentes venenosi" or "thanatophidia"). They may be considered as actively poisonous and, as such, dangerous to man and large animals. But besides these notoriously poisonous species are others which also possess a venenific system but which are not included in the same group because the poison fangs are located in such a position that only by the merest accident can they injure men or animals.

Poisonous snakes belong to three distinct groups:

- (a) the *Opisthoglypha*, characterized by enlarged posterior maxillary teeth, having a longitudinal groove beginning near the excretory canal of the poison gland. These snakes are not generally classified as poisonous (serpentes suspecti).
- (b) the *Proteroglypha*, or *Elapidae*, characterized by anterior maxillary teeth that are differentiated and have a partly closed canal communicating with the poison gland.
- (c) the *Solenoglypha*, with movable fangs, articulated, having a completely closed canal and communicating also with the poison gland.

There remains the *Aglypha* group, which, although having a poison gland, lacks special teeth and consequently is even more inoffensive than the *Opisthoglypha*.

The poison has the twofold function

of paralyzing and killing the victim and of beginning the digestion (we must not forget that the animal is swallowed whole), so it must be inoculated into the living animal, in order that it might spread through the entire organism. The venenific system is composed of a gland whose excretory duct arises at the base of the grooved tooth. This gland is similar to the salivary gland of mammals and is situated externally, behind the socket, is pear-shaped and enclosed in a fibrous capsule in which is inserted the anterior temporal muscle, whose contraction causes the forcible ejection of the poisonous liquid through the small canal of the tooth. The teeth of the *Viperidae* (of the *Solenoglypha* group), being erectile, rise during the attack, and this allows them to penetrate deeply into the tissues of the victim. The attack is made by a thrust of the snake, which extends itself like a spring, recoiling immediately to its previous position.

Besides serpents that inoculate their venom by a bite, there are others that project it to a distance by the sudden contraction of the masseter muscle, which compresses the poison gland.

The amount of poison that can be inoculated, its toxic activity, and the greater or lesser rapidity of its absorption determine its degree of danger for man and large animals. Thus the most dangerous snakes are found among the *Solenoglypha*, in the *Colubridae* and *Viperidae* families.

Snake venom is a mixed saliva composed of the secretion of the serous poison glands, together with that of certain supralabial mucous glands. It may be obtained separate from the product of the mucous glands by various meth-

* From the Department of Ophthalmology, Escola Paulista de Medicina. Read before the American Academy of Ophthalmology and Otolaryngology, at Washington, D.C., October, 1938.

ods; for instance, by letting the snake bite an impermeable membrane stretched over glass, or by pressing the edge of a Petri-dish against the root of the teeth, and similar methods. It is light colored, varying from milky to gray or yellow, according to the species of snake; it is viscous, and contains cellular impurities that sometimes make it turbid. The proportion of solid matter varies according to the species, being about 20 or 30 percent. When dry, the venom takes a pseudocrystalline form. In the dry state it can be preserved for a long time without deteriorating. It is, however, rapidly and intensely affected by ultraviolet rays, and to a lesser extent by the roentgen and infrared rays.

Besides water, the venoms contain variable quantities of pigment, small quantities of substances soluble in ether (chlorides, phosphates, and other mineral salts in smaller proportions, proteins coagulable by heat, proteoses, and sometimes peptones). Certain enzymes are the cause of some of its activities, and it is not yet known if its toxicity is due to small quantities of some highly destructive substance absorbed by the elements already known, or if it is produced by the very proteins already identified.

The way in which the different poisons act varies according to the predominant group of elements, but, in general, the venoms contain the same active principles, the respective proportion alone varying, and that to a notable degree.

According to Houssay,¹ the venoms of the various serpents may be grouped as follows:

I. Toxin action:

- (a) curarizing action (*Naja naja* type)
- (b) neurotoxic action (*Crotalus terrificus* type)
- (c) shock-producing action (*Lachesis* and *Bothrops* type)

- (d) coagulating action (*Vipera russelli* and *Bothrops* types)

II. Phosphatidasic action:

- (a) hemolytic action
- (b) action inhibiting coagulation
- (c) cytolytic action

III. Protease action:

- (a) local irritation action, swelling, hemorrhage
- (b) hemorrhagic, gangrenous action (*Lachesis* type)

In group III, pancreatic hemorrhages and fatty necrosis by injection of the pancreatic duct are also included, as well as distal hemorrhages, besides the diminution of fibrinogen in the blood stream (*Crotalus adamenteus* and *Lachesis flavoridis*)

IV. Thrombinic action—coagulation of blood. In this type alterations of erythrocytic resistance, reduction of precipitation rate, shock, drop of arterial pressure, leucopenia, and alterations of the blood albuminoid bodies are also included.

Ever since the days of empiric medicine, back to Galeno's reference to the cure of a leper who had taken wine from a barrel in which a snake had drowned, snake venom has been used as a therapeutic agent. In Oriental medicine, this venom is included in the pharmacopoeia, and in homeopathy the venoms of *Crotalus* and *Lachesis mutus* occupy a prominent place.

Similar to Galeno's case, during the eighteenth century and beginning of the nineteenth, there have been several other cases of lepers who claimed to have been cured after snake bites. Based on these assertions, Mariano Jose Machado submitted himself voluntarily to the bite of a *Crotalus terrificus*. This experiment was made before several physicians in

Rio in 1840 and resulted in the death of the patient within 24 hours. An interesting detailed description of the effects of the venoms was recorded, but no mention was made of ocular disturbances.

Vital Brasil,² in São Paulo, injected into various lepers nonlethal doses of the venom of *Crotalus terrificus*, without obtaining any improvement. In the United States of America, A. Self, and afterwards Spangler, were the first to recommend the use of rattlesnake venom in the treatment of epilepsy and asthma, but the favorable results are much disputed, and recently Finkelmann³ verified the inefficacy of the venom of *Agkistrodon piscivorus* in the treatment of epilepsy with the product derived from that venom and called "Moccasinmulford." Peck⁴ and Sabotka used the venom of *Agkistrodon piscivorus* in the treatment of hemorrhagic diseases, its use having been extended by MacFarlane and Barnett⁵ to the treatment of hemophilia. The isolation of the coagulating principle of the venom of *Bothrops jararaca* by von Klobusitzky⁶ opened up a wider field to its use in the treatment and prevention of hemorrhages.

Monaelesser and Taguet,⁷ as well as Laignel-Lavastine,⁸ Calmette,⁹ and Koresios,¹⁰ developed the idea of using *Naja* venom in the treatment of cancer and of algias whether cancerous or not, the method being still the object of discussion and study. *Naja* venom was also employed against high blood pressure but with varying results.

The use of these various venoms in the treatment of the diseases mentioned is based on the study of their respective physiological properties, but in some cases—for example, in epilepsy, algias, and so forth—the results of its accidental use led the investigators to make further research. Thus, if the use of certain venoms to increase the coagulability of the

blood arose from the knowledge of their different properties, the use of others in the treatment of epilepsy, cancer, and other diseases came from empiric observations of improvement in persons accidentally bitten. Thus the observation of the sedative action of the poison of a spider (*Lycosa*) on the pains of a leper, and mentioned by Monaelesser, led Calmette to further systematic studies of the soothing effect of *Naja* venom, whose paralyzing action on the sensory nerves was already known.

The properties of various venoms have been studied in recent decades, and they are used according to their physiological action for a corresponding pharmacodynamic effect. The venoms in which the neurotoxic element predominates are naturally indicated for the treatment of algias because of their soothing effect upon sensitiveness (*Naja naja*, *Crotalus terrificus*, and others). Likewise the venoms in which the coagulating principle predominates are logically the most appropriate for the therapeutics of hemorrhagic conditions, and the proteolytic factors for the treatment of malignant tumors.

As has already been stated, the venoms contain, together with desirable elements, useless ones, and only the isolation of the former can give a greater therapeutic value to snake venom. Their isolation has been obtained by the fractioning of the various component factors. Thus, the coagulating element of the venom of *Bothrops jararaca* was isolated by von Klobusitzky and Koenig,^{6, 11} and there are on the market pharmaceutical products derived from fractioned venoms and with well-defined pharmacodynamic properties ("Hemocoagulase" and "Bothropase"). Slotter and Fraenkel-Conrat,¹² also by fractioning, succeeded in isolating the active principle of the venom of *Crotalus terrificus*,

and in obtaining "Crotoxina," with an action similar to that of ferments, and which, while it acts upon the lipoids of the nervous tissue, acts likewise upon the lecithin of the blood cells, causing hemolysis, combining therefore two of the properties of the venom of *Crotalus terrificus*, neurotoxic and hemolytic, but without the coagulating property.

To reduce the toxicity of the venoms, various methods have been employed which, while diminishing their toxic and irritant qualities, still retain the useful properties. Among them is the weakening of the venom by formol, as Ramon did with toxins, for which reason the venoms thus detoxified are called anavenoms. Likewise, Esveld, making a very weak solution of the venom of *Naja sputatrix*, and inactivating it, prepared a pharmaceutical product of definite properties, known on the market as "Cobratoxin." Similarly Brecher¹³ prepared a solution used in the treatment of trachoma and called "Trachozid." Still others (Vital Brasil) prepared very dilute solutions of venoms, without other modifications, and used them for therapeutic purposes. It is well to remark here that the action of the venoms varies greatly according to the dose. For instance, that of *Bothrops jararaca*, as von Klobusitzky found, has an anticoagulating effect in strong doses, but is intensely coagulating in weak ones.

Snake casualties are relatively frequent. In India, according to Chopra and Isvariah,¹⁴ there are from 20,000 to 25,000 cases of death from snake bite. In Australia, Fairley mentions 240 fatalities. In Europe such casualties are rarer, and in Prussia from 1920-1925 there were but 150 cases of people bitten by snakes (*Vipera berus*), only one case being fatal. In the United States of America, according to Hutchinson, there were in 1929 about 500 cases, with a mortality of about 16 percent in those

not treated, and of 3.75 percent in those treated with serum. In Brazil, of 8,000 cases mentioned by Kraus, over a period of about 20 years, the mortality was from 25 to 30 percent in the cases not treated, dropping to 2.7 percent in those treated by serum.

OCULAR COMPLICATIONS

Ocular disturbances in cases of snake poisoning differ in nature and vary in frequency according to the species of the serpent. The Institute of Butantan, at São Paulo, Brazil, has been dealing with ophidism since the beginning of the century. In an effort to ascertain the various consequences of snake poisoning, it distributes, together with the ampullae of curative serum, a questionnaire in which is to be registered the various phenomena observed. Among the questions is: "Was there blindness?"

In the 5,780 questionnaires at hand, covering a period of years from 1902 to 1937, we find the distribution (see table at top of next page) of casualties caused by the different species, the first column giving the total number, the second the number of ocular casualties, and the third, the percentage relation.

The ocular lesions described in reply to the question: "Was there blindness?" were quite varied, and, if the description of the ocular phenomena observed is fairly exact in many cases, in others there is merely the mention of a "darkening of the sight." The ocular symptoms described for rattlesnake poisoning include "darkening," appearing immediately after, and sometimes six hours after the bite. The functional disturbance varies, being sometimes only a dimming of the sight, sometimes a complete loss. The duration of the phenomena is also variable, from only a few minutes to more than 10 days, disappearing generally immediately after the applica-

	Total Number	Ocular Casualties	Percent
<i>Crotalus terrificus terrificus</i>	643	387	60.1
<i>Lachesis mutus</i>	13	7	53.7
<i>Bothrops cotiara</i>	64	16	25.0
<i>Micrurus corallinus</i> (<i>Proteroglypha</i>)	12	3	25.0
<i>Bothrops jararacussú</i>	610	121	19.8
<i>Bothrops alternata</i>	351	61	17.5
<i>Bothrops neuwiedii</i>	203	25	12.3
<i>Bothrops jararaca</i>	2,707	277	10.2
<i>Bothrops atrox</i>	91	4	4.4
Unidentified snake	1,084	183	16.9

All the serpents above referred to, with the exception of *Micrurus corallinus* are *Solenoglypha*. From the above data, one can clearly see the frequency of ocular involvement after the bite of a rattlesnake (*Crotalus terrificus*) which is further confirmed by common observation.

tion of the serum. There have also been cases in which the visual disturbance appeared immediately after the application of the serum. Other sequelae noted were conjunctival hemorrhages, edema of the cornea, impossibility of opening the eyes, paralysis of the ocular movements, squint, lid ptosis, monolateral blindness, mydriasis, and others.

Lachesis mutus caused edema of the cornea and subconjunctival hemorrhages.

Bothrops cotiara caused xanthopsia, among other phenomena. *Micrurus corallinus* caused lid ptosis, edema of the cornea, "darkening of the sight."

Bothrops jararacussú caused the loss of sight, which happened immediately after the bite, and sometimes two days after, the disturbance being of variable duration.

There were also cases of conjunctival hyperemia without other ocular disturbance, a feeling of pressure in the eyelids, lid ptosis, lid edema, and photophobia.

Bothrops alternata caused temporary blindness, without other external phenomena. It is an interesting fact that monolateral blindness was seen in three cases in animals (dogs and a cow).

Bothrops neuwiedii and *Bothrops jararaca* cause the appearance of functional

disturbances that vary from the "darkening of sight" to its loss, the latter being in some cases intermittent. The appearance of the visual phenomena also varies, coming sometimes immediately after the bite, sometimes 14 hours after. The duration may be from a few minutes to many hours. In some cases the appearance of blindness coincided with the injection of the serum. Pupillary mydriasis was noticed, also ocular pain, hyperemia, and defective venous circulation.

From ophthalmologists residing in Brazil, we have endeavored to learn what they observed in regard to ocular manifestations in patients bitten by venomous serpents, and for that purpose sent a questionnaire to the 250 ophthalmologists whose names are registered in the last edition of "Indicia Medicorum." We also extended our inquiry to several colleagues in Uruguay and Argentina. From the replies received there seem to be few observations of the ocular manifestations of ophidism, which is confirmed by the scanty references to the subject in the literature of this specialty.

My colleagues reported the following:

Odilon Alves¹⁵ observed a case of uveitis with ocular hypertension in a patient bitten by a *Bothrops jararacussú*

four months previously. The patient felt pains in his eyelids immediately after the bite, having used antiothropic serum.

Durval Prado¹⁶ noticed a patch of chorioretinitis, finely pigmented, in a patient who had been bitten two years before by *Bothrops jararaca* and remained blind until the application of the serum. Later her sight returned, and she consulted a physician because of phenomena of accommodation asthenopia, unaware of the lesion in the fundus.

T. Falcao¹⁷ mentions the case of a Japanese who became blind and deaf in consequence of a snake bite, but who did not know the species and refused to submit to an examination.

O. Carleial¹⁸ observed a case of optic atrophy in both eyes with complete blindness in a man bitten by a *Crotalus terrificus*, two months before. Besides blindness, attributed to the bite, the patient had atrophy and contractures of the bitten limb.

Prof. J. Britto¹⁹ reported that in his observation of 80,000 patients, whether in a private or a hospital clinic, he met only two cases of ocular lesions that were attributed by the patients to snake bites. In the first case there was anophthalmus of the right side, following an enucleation in consequence of a snake bite in the very eyeball, and in the second case atrophy of the eyeball on one side and a subluxated cataractous lens in the other eye, the patient saying that the trouble in his eyes had begun after the bite.

S. Martins²⁰ found blindness, conjunctival hemorrhages, and edema of the cornea in a patient bitten by a *Crotalus terrificus terrificus*. This patient died five days after the bite, not having been treated with serum.

Prof. Linneu Silva,²¹ in more than 30,000 cases, noticed only one case of

retinal hemorrhage in a patient who had been bitten a few days before by a poisonous snake, species unknown.

H. Goes Ferreira²² reports the case of a patient suffering from optic atrophy in both eyes who said it began after a snake bite, the other malignant effect of which had been cured by empiric treatment.

Pereira Gomes,²³ among 60,000 private and 30,000 hospital patients, over a period of 26 years, saw only one case of ocular disturbance arising from snake bite. This was from a *Crotalus terrificus* and caused a discrete hemorrhage with edema that extended even to the corneal epithelium, and also pupillary mydriasis. He could not ascertain if there was paralysis of the extrinsic muscles because of the patient's state of prostration, and it was necessary to force open the eyelids in order to examine them. Ophthalmoscopy, hindered by edema of the cornea, revealed slight hemorrhages of the retina in the visible parts, it being impossible to ascertain the state of the discs. There was a great reduction of visual acuity which lasted throughout the period of toxicity. Even after recovery the toxic amblyopia continued, the sight returning without any atrophy of the discs or other noteworthy alteration. The patient received injections of specific anticrotalic serum and recovered.

The present writer²⁴ has seen, among his private and hospital patients, more than 35,000 in number, only one case of ocular disturbance from snake bite. There was only a certain difficulty in opening and moving the eyes, which seemed to the writer to be of a pithiatic nature. The patient, who had been bitten 16 times by *Crotalus*, reported that each time he suffered from great functional disturbances which made him blind. The first times he had been treated with serum but afterwards he was already

immune. In the fundus oculi nothing abnormal was noticed, eye and lid movements being normal as well as the pupillary reflexes.

Vital Brasil reports that the venom of *Bothrops jararacussú*, contrary to the action of that of *B. jararaca*, causes visual phenomena characterized by dimming of the sight. He says, also, that the venom of the *Elapinae* causes lacrimation with temporary blindness, and that the venom of the *Crotalus* always causes visual disturbances. In the clinical records published by Vital Brasil there are various references to visual disturbances after snake bite, among them some that give a more detailed description. But the references found in medical literature as to the effect of snake venom on the eyes are generally quite scanty.

Boullet,²⁵ Encongnères,²⁶ Magalhaes²⁷ in 1875 mention cases of blindness after snake bites, but do not describe the lesions observed. Knies²⁸ suggested the hypothesis, not based on facts observed, that the ocular lesions are due to central hemorrhages, or hemorrhages in the eyeball itself. Lesions of extrinsic muscles described by Richards,²⁹ DeVere Condon,³⁰ and Rennie mentioned ptosis and protrusio bulbi, and Berenger-Feraud³¹ described conjunctival and corneal changes from pure venom that had reached the eye. Hilbert³² call attention to xanthopsia appearing after snake bite. More recently Blatt³³ described cases of ophidism in which he observed pupillary mydriasis, paresis of accommodation, palpebral ptosis, and paresis of the extrinsic muscles. Bakker³⁴ and Schunek³⁵ mentioned ocular lesions from the venom of *Naja tripudians sputatrix* and *Sepedon haemachates* that entered the eye. Zanne-
tin³⁶ and Sarnelli³⁷ found ocular lesions caused by the venom of *Naja nigrocollis*. These last species of serpents, when attacked, are accustomed to project the

venom to a distance. The eyes thus hit show whitish conjunctival changes due to the proteolytic action of the venom. There are also formations of milk-colored membranes. The lesions are very painful, but the inflammatory phenomena pass after five or six days, leaving no traces. When the cornea is hit, the effect is more serious, with danger of losing the eye. The treatment consists of washing the injured part with serum and the application of the antiophidic serum parenterally, locally, or subconjunctivally. Peratoner³⁸ noticed in patients bitten by vipers slow pupillary reflexes and ptosis which promptly disappeared on application of the serum. Cesario de Andrade³⁹ mentioned the constant appearance of ptosis palpebrae in cases of poisoning by serpents of the *Colubridae* group, giving as characteristic of the ocular disturbances caused by the poisons of the *Viperidae* mydriasis and pupillary paralysis with edema of the cornea; he also noticed the frequent disturbances of visual acuity. In the case of a bite by *Bothrops jararacussú*, he also noticed xanthopsia. Experimenting with the eyes of animals, Kellaway⁴⁰ found that even nonlethal doses of the venom of *Notechis scutatus* caused blindness. Koressios,⁴⁰ after injecting *Naja venom* in a dose of 1.50 mg. under the conjunctiva of rabbits, noticed, seven minutes later, a lasting miosis with paralysis of the light reflex. He also noticed a rise in the blood pressure and a dilation of the arteries of the fundus. After an intramuscular injection of 1.50 mg. of *Naja* venom, he observed in man a miosis of an hour's duration, accompanied, in one case, by a fall of the ocular tonus. This diminution, however, was not observed in other cases. He also noticed a slight rise in the blood pressure in the retina, more conspicuous in pathological cases; also an incipient contrac-

tion, followed by dilation of the retinal vessels.

Giannantoni,⁴¹ using solutions of *Naja* venom in doses of 1.50 mg. for on instillations in the conjunctiva, and subconjunctival, retrobulbar, and intramuscular injections, found no action when the venom was introduced by the two latter methods, in contrast with its application by instillation and subconjunctival injection. This caused a pronounced miosis and fall of the ocular tonus that lasted several days. He also observed that a repetition of the injections caused an increase of the hypotensor action, which extended to the other eye. He also made subconjunctival injections after the instillation of cocaine, atropine, and pilocarpine, noticing the inhibitions of the mydriatic and anesthetic action of cocaine, an increase of the mydriatic action of atropine, and an increase of intensity without an increase in duration of the action of pilocarpine. In painful glaucoma, retrobulbar injections seem to ease the pain, but the effect is not lasting. Lebus and Hubert,⁴² using *Naja* venom, noticed a lowering of ocular tonus.

At the Pinheiros Institute we made the following experiments with rabbits (*Lepus orictolagus cuniculus*):

1. Rabbit no. 680. Subcutaneous injection of 1 c.c. of a 2-percent solution of the venom of *Bothrops jararaca*, corresponding to 2 mg. of the pure venom. We noticed only a dilation of the conjunctival and retinal vessels. The ocular tonus remained unchanged. There was a slight initial miosis followed by retardation of the light reflex.
2. Rabbit no. 681. Injection of 3 mg. of the venom, 1½ c.c. of the solution of *Bothrops jararaca*. There was no pupillary alteration, except a retardation of pupillary reflex after 12 hours which lasted for about 48 hours. Dilation of the conjunctival vessels was observed; the retinal vessels were normal, the ocular tonus unaltered.
3. Rabbit no. 683. Injection of 4 mg. of the venom of *B. jararaca*. After 12 hours there were pronounced conjunctival hyperemia and slight retinal hemorrhages, slight am-

pulliform dilations in the vessels of the retina, slow reaction of the pupil to the light, and slight subconjunctival hemorrhages.

4. Rabbit no. 684. Injection of 5 mg. of the venom of *B. jararaca*. After 10 hours there was a marked conjunctival and perikeratic hyperemia. The retinal vessels were dilated, with the formation of small ampullae and peripheral hemorrhages. Complete blindness developed 24 hours later, and edema of the optic nerve appeared after 36 hours. After 60 hours the edema disappeared and the retinal vessels were thinner. It seemed to see again. There was no alteration of the ocular tonus. Pupil dilated, with weak and retarded light reaction. After 84 hours the pupillary reaction was normal and there were no more vascular alterations.
5. Rabbit no. 682. Injection of 6 mg. of the venom of *B. jararaca*. Eight hours later there was conjunctival and perikeratic hyperemia, ampulliform dilations of the vessels of the retina, and slight terminal hemorrhages. Vessels of the iris dilated. Pupillary reaction retarded and slow. Complete blindness 36 hours later, with edema of the optic nerve and slight hemorrhages on the disc besides the other alterations. Papillary stasis disappeared after 60 hours, but the blindness persisted. The retinal vessels decreased in caliber and the perikeratic hyperemia disappeared; 84 hours after, there was still vascular dilatation, and blindness persisted. This rabbit died 10 days after the injection.
6. Rabbit no. 686. Injection of 8 mg. of the venom of *B. jararaca*. Six hours after, there were choked disc, dilated vessels, pupillary mydriasis, paralysis of the light reflex. Death of the rabbit occurred 6½ hours after the injection.
7. Rabbit no. 684. Injection of 5 mg. of the venom of *B. jararacussii*. Ten hours after, the pupils showed a slow reaction, and there was a slight edema of the optic nerve. Retinal vessels dilated. Slight hemorrhages. Perikeratic hyperemia, dilation of the visible vessels of the iris. Sixty hours later there was still vascular dilatation and mydriasis. Eighty-four hours after, the hyperemia had disappeared, as well as the papillary stasis; there were no signs of blindness.
8. Rabbit no. 198. Injection of 6 mg. of the venom of *B. jararacussii*. Three hours later there was pupillary mydriasis, with slow reaction to the light. Ten hours after, we noted a slight choking of the disc and dilation of the retinal, conjunctival, and iridic vessels. Absence of perikeratic hyperemia.

Sixty hours later there was still ampulliform dilatation of the vessels both of the conjunctiva and of the retina. The pupil was already in miosis with normal reflex. No signs of blindness.

9. Rabbit no. 319. Injection of 8 mg. of the venom of *B. jararacussu*. There were my-

10. Rabbit no. 828. Subcutaneous injection of 1 c.c. of a 1-percent solution of the venom of *Crotalus t. terrificus* equivalent to 1 mg. of venom. Two hours afterwards we noticed that the pupillary light reflex was slower; in the ocular fundi nothing abnormal was noticed. Ten hours afterwards

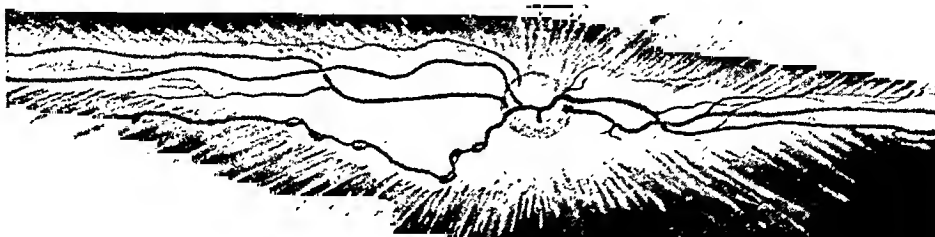


Fig. 1 (Alvaro). Fundus of rabbit no. 684, ten hours after parenteral injection of a sublethal dose of *Bothrops jararaca* venom. Ampulliform dilated artery can be seen.

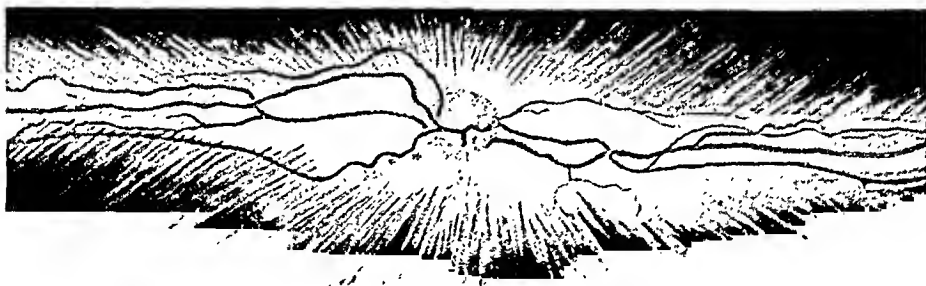


Fig. 2 (Alvaro). Fundus of the same rabbit as in figure 1, twelve hours after parenteral injection of a sublethal dose of *Bothrops jararaca* venom. Minute hemorrhages can be seen.

driasis and slow reflexes. Ten hours afterwards there was dilatation of the retinal, conjunctival and iridic vessels, and slight edema of the disc. Absence of perikeratic injection. Thirty-six hours afterwards there was still the ampulliform dilatation of the conjunctival and retinal vessels. Sixty hours afterwards, the vascular dilatation and the choked disc still persisted but the pupils were already normal. No signs of blindness.

the retinal vessels were dilated, and there was a slight edema of the disc. The pupil was in miosis with normal light reflex. The rabbit died during the night.

11. Rabbit no. 394. Subcutaneous injection of $1\frac{1}{2}$ c.c. of a 1-percent solution of the venom of *Crotalus t. terrificus*, equivalent to 1.5 mg. Two hours afterwards the pupillary light reflex was slower in the fundus oculi. Nothing abnormal. Eight hours afterwards a slight pupillary miosis

with normal light reflex, slight edema of the disc, and contracted retinal vessels were seen. Twenty-three hours afterwards there was a mydriatic pupil without light reflex. The retinal vessels were contracted with ampulliform dilatations and slight terminal hemorrhages. Slight edema of the disc. The visual function seemed to have ceased. There was paralysis of the hind parts of the animal. This rabbit died 27 hours after the injection.

12. Rabbit no. 463. Subcutaneous injection of 2 c.c. of a solution equivalent to 2 mg. of the venom of *Crotalus terrificus*. Two hours afterwards the pupillary light reflex was slow. In the fundus oculi we noticed slightly dilated vessels with the

already a slight edema of the cornea and conjunctival chemosis; ocular tonus of the left eye 3 and 6, the right eye still at 4 and 7. At 11:40 the edema of the cornea as well as the chemosis was more pronounced. Intense subconjunctival hemorrhages. Very marked miosis. With the slit-lamp we noticed that the vessels of the iris were dilated and there was a marked tyndallization of the aqueous. At 2:00 P.M. the tyndallization had disappeared, as well as the edema of the cornea. A slight chemosis persisted. Miosis disappeared and there were normal reflexes. The ocular tonus of the left side was 7 and 10 while that of the right one was 5 and 8.

14. Rabbit no. 555. Ocular tonus at 10:52 A.M.

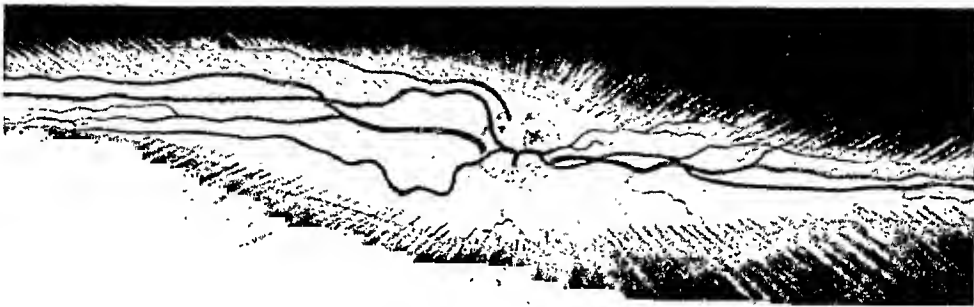


Fig. 3 (Alvaro). Fundus of rabbit no. 682, 36 hours after parenteral injection of a sublethal dose of *Bothrops jararaca* venom. Small hemorrhages on the disc and a slight edema can be seen.

blood clearer in color than normal. Six hours afterwards the vessels of the retina appeared very contracted with ampulliform dilatations. The pupil was very large with slow contraction movements in the light. The rabbit died seven hours after the injection.

13. Rabbit no. 600. At 10:50 A.M., the ocular tonus was taken and showed 4 and 7, with weights of 5.5 and 7.5 in the Schiötz tonometer. At 11:00 A.M., injection of 0.2 c.c. of a 20-percent solution of the venom of *B. jararaca*, equivalent to 0.4 mg., under the conjunctiva of the left eye, after anesthesia with a 0.5-percent solution of pontocaine. At 11:06 there was a strong conjunctival hyperemia with slight hemorrhage and intense miosis of the left eye. No changes in the right eye. The ocular tonus of the left eye was 2 and 4 respectively, while that of the right eye continued at 4 and 7 with the weights given above. At 11:20, the intense miosis persisted, there being

was 4 and 7 respectively, with weights of 5.5 and 7.5. Injection at 10:53 of 0.2 c.c. of a solution of the venom of *B. jararacussú* (0.4 mg.) under the conjunctiva of the left eye, after anesthesia with a 0.5-percent solution of pontocaine. At 11:07 there was intensive miosis. The ocular tonus in the left eye was at 2 and 4, that of the right eye remaining at 4 and 7. Slight conjunctival hyperemia at the place of injection at 11:32. The tonus of the left eye was 3 and 6, that of the right eye remaining at 4 and 7. There were intense miosis, very marked chemosis, edema of the cornea, and slight subconjunctival hemorrhages. At 12:45 there was a marked edema of the cornea in the left eye, with intense chemosis and miosis. Some subconjunctival hemorrhages and tyndallization of the aqueous could be seen with the aid of the slitlamp. Abundant conjunctival secretion of the membranous type. At 8:30, the tyndallization had disappeared as well as the chemosis, the edema,

- and the miosis. The ocular tonus was 7 and 10 in the left eye, that of the right one being 5 and 8.
15. Rabbit (not numbered). The ocular tonus at 11:00 A.M. in both eyes was 4.5 and 7. At 11:15 subconjunctival injection of 0.1 mg. of the venom of *Crotalus terrificus* diluted in 0.2 c.c. of water, in the left eye. At 11:20 the ocular tonus of this eye was 4 and 6, while that of the right eye remained 4.5 and 7. At 12:00 there were chemosis and slight conjunctival hemorrhages, absence of tyndallization of the aqueous, and of edema of the cornea. Pupils were normal with normal reflexes. At 9:00 P.M. there were very marked chemosis and edema of the eyelids which closed the eye and prevented the opening of the lids. Cornea, aqueous, and iris were normal. Tonus of the left eye 10 and 12; of the right eye 4.5 and 7.
 16. Rabbit no. 532. At 10:10 we instilled two drops of fresh pure venom of *B. jararaca* in the conjunctiva and the cornea of the left eye, keeping the lids apart for 30 seconds to make sure that the venom came in contact with the conjunctiva and cornea. At 10:26 there were strong edema of the eyelids, intense chemosis and edema of the cornea, miosis, conjunctival hyperemia, and slight subconjunctival hemorrhage. Twenty-seven hours afterwards, the edema of the cornea still persisted, and there was infiltration, chiefly in the exposed part of the cornea. The chemosis also persisted, with scanty secretion. Pupil was immovable and of normal size. No changes in the fundus. "Milky" cornea. The time of coagulation of the rabbit's blood, after 24 hours, was 30 seconds.
 17. Rabbit no. 531. At 10:12 A.M. we instilled in the left eye two drops of fresh pure venom of *Crotalus terrificus*. At 10:28 there was hardly any local reaction, only the pupils were both dilated and without reaction to light. Fundus unaltered. The time of coagulation of this rabbit, after 24 hours, was 50 seconds.
 18. Rabbit no. 558. At 10:14 A.M. we instilled into the left eye two drops of fresh pure venom of *B. jararacussú*. At 10:28 strong edema of the lids, chemosis, conjunctival hyperemia, slight subconjunctival hemorrhages, membranous secretion, miosis. Twenty-seven hours afterwards intense keratitis, principally in the part exposed. Chemosis, marked membranous secretion, edema of the lids. In the left eye there were mydriasis and absence of the light reflexes. Retinal vessels dilated. The time of coagulation, after 24 hours, was more than two hours. Ninety-six hours afterwards, the cornea of the left eye, under examination with the slitlamp, showed deep perforating ulceration and hernia of the iris. This rabbit was then given a parenteral injection of 5 mg. of venom of *Crotalus t. terrificus*, showing, one hour afterwards slight dilatations of the retinal vessels. This rabbit died two hours after injection of the *Crotalus* venom.
- Doves were also inoculated with lethal doses of the venom of *B. jararaca*, *B. jararacussú*, and *C. terrificus* to verify the toxic power of the venom employed in the experiment carried out, and in these birds pupillary mydriasis was always found before death from the three venoms mentioned. From the experiment with rabbits, 1 to 6, we concluded that the venom of *B. jararaca*, in sublethal doses, caused the following phenomena: blindness, edema, slight hemorrhage in the disc; ampulliform dilatation of the retinal vessels, chiefly in the terminal part, with slight hemorrhages adjacent; hyperemia of the vessels of the conjunctiva and pericornea, as well as those of the iris; pupillary mydriasis with retardation of the light reflex. All these phenomena tended to subside. There was no alteration of the ocular tonus. It is to be noted that blindness cannot be explained only by the ophthalmoscopic signs verified, since with the venom of the *B. jararacussú* these symptoms were also present without any apparent blindness.
- The experiments with rabbits 7 and 9 showed that the venom of the *B. jararacussú* in sublethal doses caused conjunctival, iridic, and retinal hyperemia, the last two with ampulliform dilatations; absence of retinal hemorrhages; slight edema of the disc; mydriasis with retardation of the light reflex; absence of blindness—there was a tendency of these phenomena to subside—and no alteration of the ocular tonus.
- The experiments with the rabbits 10 to 12 showed that the venom of *Crotalus*

terrificus in lethal and sublethal doses caused pupillary modifications, characterized by temporary miosis, followed by mydriasis with retardation of the light reflex. The retinal vessels were at first dilated and then underwent a contraction, with ampulliform dilatations and slight peripheral and terminal hemorrhages; slight edema of the optic nerve. The visual function seemed to cease 24 hours after the inoculation. The ocular tonus did not seem to be affected by the venom.

The experiments made with rabbit 13 showed that the venom of *B. jararaca*, in a dose of 0.4 mg. in a subconjunctival injection, produced a local reaction of great intensity, with edema and slight hemorrhages, accompanied by immediate miosis and a marked increase of the ocular tonus; afterwards there was the formation of exudates in the aqueous. About 10 hours after the injection, the inflammatory phenomena subsided, and there was a marked lowering of the ocular tonus, as compared with the other eye.

The experiments with rabbit 14 showed that the action of the venom of *B. jararacussú*, in a subconjunctival injection, was less intense, chiefly as regards the hemorrhages. There was, however, a marked formation of conjunctival secretion of membranous character. The action on the pupil and the ocular tonus was identical with that described for *B. jararaca*.

The subconjunctival injection 0.1 mg. of the venom of *Crotalus terrificus* in rabbit 15 showed the late tonus-reducing action 10 hours afterward, after a slight, immediate tonus-increasing action. There were absence of phenomena in the cornea and the uvea, unaltered pupil, only marked chemosis, and slight conjunctival hemorrhages. Marked edema of the lids prevented their movements.

The instillation of pure venom of

Crotalus terrificus in the conjunctiva in confirmation of the observation of Vital Brasil⁴³ showed the weak local action and the absorption of venom thus applied.

The instillation of venom of *B. jararacussú* showed the local irritant action of the venom, characterized by abundant membranous secretion. The absorption of venom, thus applied, was also shown.

The instillation of the venom of *B. jararaca*, as Vital Brasil⁴⁴ also observed, provoked phenomena of local irritation similar to those noticed with the venom of *B. jararacussú*, less intense towards the cornea and without the appearance of secretion. The time of blood coagulation, after 24 hours, showed that there had been absorption of the venom.

The inoculation of lethal doses of venom in doves showed the constancy of pupillary mydriasis.

The solutions of the venom used in the experiments were tested by the injections in doves in order to check their toxic power. Thus a solution of 4 mg. of venom of *B. jararaca* caused the dove's death in 20 minutes. A 0.006-mg. solution of the venom of *B. jararacussú* caused death in 20 minutes, and a 0.0015-mg. solution of the venom of *C. t. terrificus* caused the dove's death in 24 hours.

The fact should be emphasized that the individual resistance of rabbits to snake venom varies greatly, as appears from the fact that some died after weaker doses, while others, after stronger doses, survived; also some that received weaker doses died before others that had been given stronger ones. This fact, however, does not affect the results observed, in view of their constancy. The minimum lethal doses of the poisons which we used are, according to Vital Brasil,⁴³ the following: *B. jararaca*, 7 mg. per kilo; *B. jararacussú*, 3 mg. per kilo; *C. t. terrificus*, 1 mg. per kilo.

Koressios,¹⁰ from the experimental

studies in which he observed the action of *Naja* venom on the eyes after a par-enteral application, to which we have already referred, concluded that this action was threefold: (1) the production of miosis of about a half-hour's duration (2) the provocation of an increase in the retinal blood pressure, and (3) a passing constriction of the arteries of the fundus.

CLINICAL

Koressios working with Bailliart tried to verify the action of the venom on the retina of normal and pathological individuals. They⁴⁵ used quantities of venom, physiologically proportioned, taking as a unit the fifth part of the minimum necessary, when injected into the femoral vein, to cause a drop in the carotid blood pressure of 3 mm. Hg in rabbits of 3 kilos weight. Koressios was led to make these clinical experiments by his observation of the improvement in the sight of a patient suffering from a syndrome of encephalomyelitis in whom he tried *Naja* venom to alleviate the pain. This patient showed extensive hemorrhages in the vitreous and could not see to walk alone; on the day after the first injection, his sight improved so that he could do so, and the improvement held for six months, when new hemorrhages reduced him to his former state.

From his experiments Koressios concluded that snake venom acts on the unstriated muscle fibers of the walls of the vessels; that the action appears in the capillary vessels at the fundus, which are at first contracted and then dilated; that in cases of capillary arteritis, venous thrombosis, and arterial spasms, it causes a rapid, marked improvement in the sight; that although organic lesions of the fundus oculi do not seem to undergo any notable modification, in some cases a marked diminution of the hemorrhages

and of the edema of the disc was noticed.

Chassaing⁴⁶ in his thesis, in which he made a thorough study of the action of *Naja* venom on the eye from a therapeutic and physiological point of view, arrived at conclusions similar to those of Koressios. Likewise Tillé,^{47, 48} collaborating with Koressios and Chassaing, showed like results obtained in the treatment of vascular retinal diseases with that venom.

Manes⁴⁹ reported having observed an improvement in the visual acuity and visual field in a patient suffering from optic neuritis after he had injected *Naja* venom into the muscle. Also in a case of disseminated choroiditis and myopia of 18 diopters he obtained an improvement in the visual acuity with the use of this venom.

Brecher,⁵⁰ using a mixture of Kretschky's "Immenine" and detoxified snake venom (*Vipera berus*) according to the observations of Phisalix and Langer, obtained favorable results in the treatment of trachoma. The remedy obtained by Brecher is 18 times less toxic than the venom from which it is derived, and seems to act on the endothelial reticula, preventing an excessive pathological proliferation of the tissues. This remedy is prepared by the Serotherapeutisches Institut of Vienna, and is found on the market under the name of "Trachozid." The process of preparing the venom is the secret of Brecher and has not been published. Favorable results were obtained with trachozid in the treatment of trachoma and especially of pannus trachomatosis by Brecher,⁵⁰ Olah-Kepich,⁵¹ Charamis,⁵² Lobel,⁵³ Lodato,⁵⁴ and Manolesco.⁵⁵ The treatment of iritis and scleritis (Charamis) with trachozid showed doubtful results, but it proved efficacious in the therapeutics of scrofulous keratitis. Trachozid is used in sub-

conjunctival injections into the conjunctival fornix. It is easily tolerated and has never caused injurious effects.

Valle⁵⁶ in leprosy patients with uveitis and keratitis in which pain was the predominant factor, used "anaveneno crotalico," a solution of the venom of *Crotalus t. terrificus* detoxified by formol, prepared by the Instituto de Butantan of São Paulo, Brazil. The results, according to Valle, were always very good, the remedy being applied in subconjunctival injections, preferably into the part of the conjunctiva corresponding to the lesion, or into the four cardinal points more or less on a level with the equator of the globe. When applied by instillation the results were not favorable. He also used anaveneno crotalico with good results in a case of ulcer of the cornea and in a case of luetic iridocyclitis, always in subconjunctival injections, to relieve pain, the other usual therapy being administered at the same time.

We have also used anaveneno crotalico to lower ocular tonus in accordance with the observations of Giannantoni,⁴¹ without, however, noticing any effect on the ocular tonus. Correa Neto⁵⁷ used with favorable results "Solutio crotalico," which, as the name indicates, is a solution of the venom of *C. terrificus* diluted 5:1,000,000, prepared in the Instituto Vital Brasil. By injecting doses that varied from 0.01 to 0.03 mg., he obtained a diminution of ocular algias arising from trigeminal neuralgias and inflammatory glaucoma.

Swett,⁵⁸ using a solution of the venom of *Agkistrodon piscivorus* 1:3,000, obtained very favorable results in the treatment of six cases of postoperative recurrent hemorrhage. He stated:

"We had the opportunity to use 'Hemo-coagulase' a product prepared by the Instituto de Butantan in São Paulo, derived from the venom of *B. jararaca*, and

isolated by disintegration according to the process of v. Klobusitzky and Koenig.⁶ We applied it locally to clean the wound of blood in ocular operations commonly disturbed by hemorrhages, for example, operations on the eyelids in the regions of the lacrimal sac, which had been operated on previously, and we always had very good results, at least equal to those obtained with other hemostatics derived from tissues. We also used hemo-coagulase in intramuscular injections on the eve of, or a few hours before, the operation and found the results very satisfactory. We also used this remedy in the treatment of postoperative bleeding after intrabulbar operations and in retinal bleeding from several sources, always with very good results."

According to Calmette,⁵⁹ Laignel-Lavastine,⁸ Taquet,⁶⁰ Castro Escalada,⁶¹ *Naja* venom and also others with marked proteolytic action can be used in the treatment of inoperable malignant tumors situated in the eye.

Vasquez Barriere⁶² used without noticeable result a solution of snake venom in cases of malignant tumors of the orbit and in cases of vascular retinal diseases as Bailliart recommends.

SUMMARY

As we have just stated, snake venoms have been employed for various purposes in the treatment of diseases of the eye. Thus the venom of *Naja sputatrix* was recommended in the treatment of high retinal blood pressure, this indication being based on the pressure-reducing effect acting, as it seems, directly on the walls of the vessels. Unfortunately, however, in opposition to the favorable results referred to by various authors (Vernes, Koressios, Bailliart, Chassaing, and others) are the observations of those who could not obtain similar results (Vasquez Barriere, and others). For the treatment

of intraorbital tumors the use of snake venom was suggested by analogy from results of intratumoral or intramuscular injections, this indication being based (Calmette, and others) on its proteolytic action, capable of destroying the tumor directly or through substances arising from its decomposition. The use of snake venom for this purpose is not indicated in view of the fact that the selective action of the venom on the tumor cells has not been proved, and there is even the danger of its stimulating the growth of the tumor, or of the formation of metastases by pieces of tissue actually detached by the proteolytic action of the venom itself (v. Klobusitzky).

In the treatment of glaucoma *Naja* venom was recommended (Giannantoni) for its miotic action and that of lowering ocular tonus, but its use has not proved equally successful in the hands of other experimenters.

To combat ocular pain arising from inflammation of the cornea and of the uveal tract or even due to increased ocular tonus, a solution of venom of *Naja* or *Crotalus* has been recommended, applied by instillation or by subconjunctival injections, this indication being based on the neurotoxic action of these venoms. The records showing favorable results (Valle, Correa Neto, and others) are, in this case, more numerous than those showing less encouraging ones, and it seems snake venom, by its neurotoxic action, may really be of great help in relieving pain in diseases of the eye.

In the treatment of trachoma, the use is advocated of a derivative of the venom of *Vipera berus* and that of bees known as "Trachozid." This remedy, which has proved very effective according to various experimenters (Brecher, Charamis, Lobel), is applied in subconjunctival and intratarsal injections. But in spite of being unquestionably a useful element in

the therapeutics of trachoma, it cannot, as yet, be considered a specific.

To avoid and combat bleeding during and after operations, and even in ocular disease in which bleeding is frequent, use has been made of derivatives of snake venom (*B. jararaca*, *Notechis sculatus*, *Agkistrodon piscivorus*, *Vipera russelli*) with very good results (Swett, and others). Indication for this treatment is based on the coagulating action of these venoms, which seem to act as thrombin, transforming fibrinogen into fibrin.

The study of the various elements found in snake venoms, whose action is not yet sufficiently known, will perhaps render possible in the future their more frequent use, and especially that of the principles that can be isolated from them. The venom, composed of various elements acting differently, has had its therapeutic use limited by the impossibility of applying each pharmacodynamic property separately. The weakening of the venom by heat, by formol, or by neutralizing certain harmful elements, although it may have a selective action in the repression of certain undesirable elements, weakens at the same time the action that is to be utilized, and retains, even though weakened, the undesirable elements.

Nothing but the isolation of the active principle whose therapeutic property is to be utilized will solve the problem. This is why we emphasized the value of v. Klobusitzky's results. He, working with Koenig, succeeded in isolating from the venom of *B. jararaca* the active principle that has only a coagulating effect. This isolation was obtained by the proper disintegration and subsequent withdrawal of all albumin particles of globulin by means of lead acetate. The substance, which acts in very dilute solutions and is extraordinarily active, belongs to the category of enzymes, being a kind of

"coagulase." Recently Slotta⁵⁶ also succeeded in isolating the neurotoxic principle of *crotalus* venom in its crystallized state; it is twice as active as the pure venom and has the double phosphatidasic hemolytic and neurotoxic property. Slotta believes that this action is in fact one and the same, the venom acting accordingly both on the lipoid of the nervous tissue and on the lecithins.

This isolation of the active principle with definite pharmacodynamic properties will in days to come encourage the use, scientifically authorized, of various derivatives of snake venoms in the treatment of many diseases. For the moment, however, their use is still much restricted, limited really to a few indications.

In closing we wish to thank Dr. Harry

Gradle, president of the American Academy of Ophthalmology and Otolaryngology, for his kind invitation to read this paper and for his suggestion of the subject. We also wish to thank Dr. D. von Klobusitzky for his help in our experiments, for the bibliography that he placed at our disposal, and his constant assistance in the preparation of this work. We also thank the Instituto de Pinheiros for allowing us to carry out experiments in animals and for the samples of "Bothropase" that we offered to our American colleagues for experimental purposes. We also wish to thank Dr. J. R. Arantes, director of the Instituto de Butantan, for the use of its library and for the venom placed at our disposal for experiments.

169 *Consolacao*.

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NOTES, CASES, INSTRUMENTS

A POLARIZING SCREEN FOR FACILITATING THE COVER TEST*†

LESTER STEIN, M.D.
New York

The cover test is one of the most important methods at the command of the ophthalmologist and the orthoptic technician. However, the significance of the movements of the eye covered by the screen is seldom stressed. The traditional use of an opaque black screen in common practice has led to failure to observe the covered eye and, in addition, has interposed difficulties in making the observations.

It is to facilitate such observations and to aid in the more thorough study of squint that the present apparatus is described. It consists of two graduated arcs (180-degree protractors) mounted on a handle in such a way that one or two polaroid screens¹ may be placed between the arcs and rotated freely (fig. 1). In this manner an angular position of the axes of the polaroid screens can be determined. For fixation two retinoscopes, one for near fixation at 25 cm. and the other for distance fixation at 6 m., are employed. These are polarized by placing caps or polaroid material over the light openings.

The principle involved in the use of this apparatus is that light polarized in any given meridian by a polaroid screen whose axis lies in that meridian is selectively absorbed by an analyzing polaroid screen whose axis is at an angle to the axis of the polarizing screen. The analyz-

ing polaroid screen corresponds to that employed in the cover test; the polarizing screen to the small polaroid caps in the retinoscope fixation lights.

The amount of absorption of the transmitted light is proportional to the angle between the axes of the polarizing

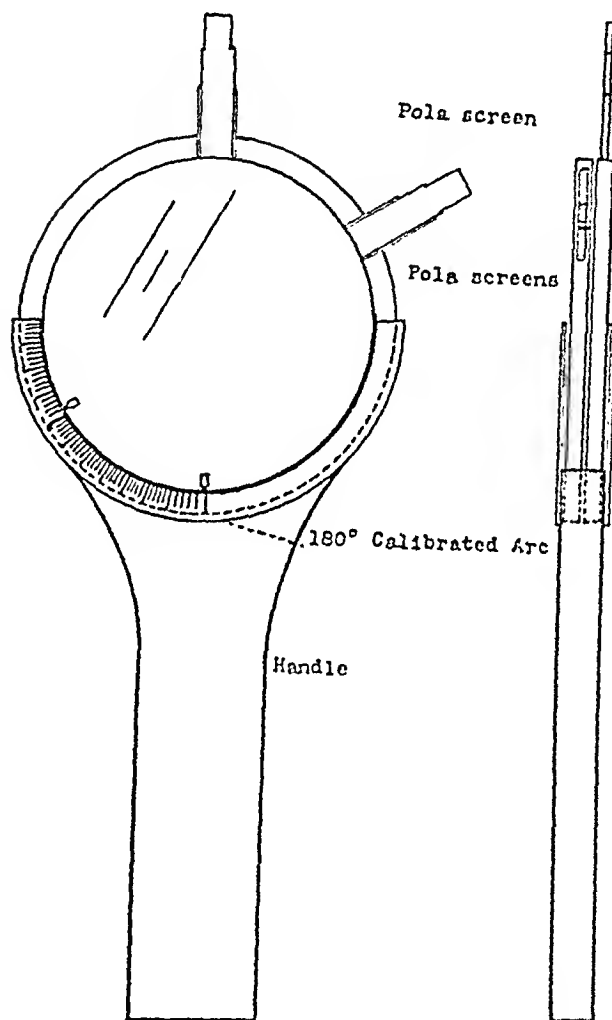


Fig. 1 (Stein). Diagram of apparatus with two Pola screens.

and analyzing screens; hence by measuring this angle or more directly by photometric measurement it becomes possible to estimate the percentage of light that is transmitted through the polaroid screens.

In practical use the screen is employed in a darkened room with just enough side-light (preferably from a polarized lamp,

* Aided by a grant from the Ophthalmological Foundation, Inc.

† From the Department of Research, Lighthouse Eye Clinic of the New York Association for the Blind, New York City.

the axis of which is parallel to that of the polarizing caps) to illuminate the patient's face in order to permit observation of the ocular movements. Good cooperation is more likely to be obtained under these conditions.

First method. The apparatus with one polaroid screen, the axis of which is set at 90 degrees to that of the polarizing cap, may be used as is customarily done to cover alternately either eye. In effect this screen is opaque to the patient's eye because with axes of the polarizing materials at right angles no light can pass through the screen in front of the patient's eye. However, the observer has an unimpeded view of the ocular movements beneath the polaroid screen.

Second method. The apparatus with two polaroid screens is placed over the eye being studied, usually the deviating eye. While the eye is fixating a white light, one of the polaroid screens is rotated and an angular measurement is made at the point of ocular deviation. The purpose of this method is to diminish the amount of transmitted light so that at the "threshold value" of retinal stimulation ocular deviation will occur. This measurement should prove of value in the study of heterophoria and particularly in amblyopia ex anopsia, ocular dominance, or alternation of fixation. By employing a photoelectric light-meter a direct reading of the amount of light transmitted through the screens can be made. If a standard source of light is employed a record of these values should prove useful in the study of the case over a long period of time.

The advantages of this transparent cover in extending the field of usefulness of the cover test are manifold. The covered eye is as readily observed in all the cardinal directions of gaze as is the fixating eye. This is of importance in certain uncommon vertical divergences associ-

ated with an anomalous position of rest.^{2, 3, 4} The apparatus facilitates the gradual darkening of either eye, thus dispensing with the use of a neutral density wedge. A "threshold" value of light intensity beyond which deviation of a covered eye occurs can be measured. Thus, a check upon the efficacy of orthoptic training in improving an amblyopic eye is provided by measuring the light minimum. With a decrease of amblyopia obtained by suitable methods a decrease of the threshold of deviation ensues. The transparent polaroid screen offers no barrier to the visualization of the covered eye by many observers and readily permits' photoflash photographic recording of unusual positions of the deviating eye.

Further adaptations of the method. Suitably sized discs of polaroid material may be employed in the trial frame or refractor or phorometer in conjunction with Maddox rods. A further adaptation of greater importance consists in the development of a variable occlusion device for partial occlusion of a dominant eye in proportion to its relative dominance over the amblyopic eye. This obviates the complicated red-green varnish method of Pugh⁵ and further is readily applied to any spectacle frame. Two superimposed discs of polaroid material are mounted in a spectacle frame with axes set at a predetermined angle so that the desired percentage of light is transmitted. The amount of transmitted light may be measured with a photoelectric light meter, provided a constant light source is standard for all similar successive measurements. Obviously the principle of light control with two superimposed discs of polaroid material can be simply applied to modify orthoptic training machines to provide variable illumination for either eye without great expense. This would render unnecessary the use

of rheostats, which are costly and often out of order.

I wish to express my appreciation for

the encouragement and assistance given me by Dr. Conrad Berens.

365 New York Avenue.

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- ¹ Eastman Kodak Pola Screen 3" diameter.
- ² Bielschowsky, A. Arch. f. Ophth., 1931, v. 125, p. 493.
- ³ ———. Arch. of Ophth., 1936, v. 15, p. 595.
- ⁴ ———. Arch. of Ophth., 1938, v. 20, p. 175.
- ⁵ Pugh, M. A. Squint training. London, Oxford University Press, 1931, p. 41.

CAVERNOUS HEMANGIOMA OF THE ORBIT WITH HYPEROSTOSIS*

REPORT OF A CASE

WILLIAM L. BENEDICT, M.D., AND
J. GRAFTON LOVE, M.D.
Rochester, Minnesota

A woman, aged 25 years, consulted physicians in the clinic on May 23, 1938, because of recurrent hemorrhages in the left orbit and the resulting exophthalmos. On March 10, 1938, she first noticed prominence of the left eye. The following day a red streak appeared on the upper lid, followed by marked ecchymosis and swelling of the upper and lower lids. The swelling and discoloration disappeared after passage of a few days, but the prominence of the eye continued, with only slight decrease, until about May 15th, when it again became much more prominent. There was no diminution in vision, and, except for slight headache, there were no symptoms associated with the exophthalmos.

At examination the eyelids were not swollen. The exophthalmometer reading at 99 mm. was 15 for the right eye and 19 for the left eye. There was no disturbance of ocular motility; intraocular tension was normal to palpation; pupils

were equal and normal in size, shape, and position; reflexes were normal. Ophthalmoscopic examination showed that in the left eye the retinal veins were from three to five times larger than those in the right eye, and the disc was injected. There was no measurable edema of the disc or of the retina. There were no hemorrhages in the retina. The vision, without glasses, was 6/6 in the right eye and 6/7 in the left eye.

A roentgenogram of the head revealed a soft-tissue tumor of the left orbit. The left optic canal was larger than the right and appeared to be somewhat eroded. The roentgenologist arrived at a diagnosis of intraorbital tumor involving the optic nerve. Hyperostosis was not noted in the roentgenograms at that time.

A diagnosis of tumor of the orbit was made. The nature of the tumor, however, could not be determined. There was no bruit or thrill in the region of the orbit, and there were no other reasons for believing that an arteriovenous aneurysm existed. The presence of hemorrhage, as indicated by discoloration of the lids, indicated marked vascular changes.

The patient was advised to undergo radium treatment, followed by a compression bandage, as a therapeutic test.

She returned to the clinic on August 15, 1938, after having noted a gradual reduction in the vision of the left eye during the preceding three months. Also.

* From the Section on Ophthalmology and the Section on Neurosurgery, respectively, of the Mayo Clinic.

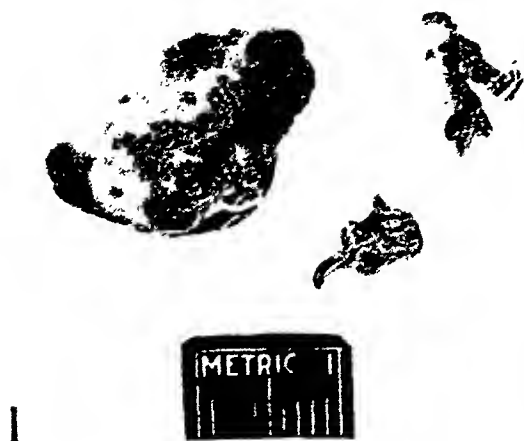


Fig. 1 (Benedict and Love). Encapsulated hemangioma, containing thrombi; removed from the left orbit of a patient on August 20, 1938.

Fig. 2 (Benedict and Love). Postoperative appearance of the patient on November 25, 1938.

headaches were increasing in severity and were limited to the left side. The vision of the right eye was 6/6, of the left eye, 6/12. Exophthalmometer readings at 99 mm. were 15 for the right eye and 19 for the left eye, as at the previous examination. A mass could not be discovered by palpation anywhere about the orbit. Some resistance was encountered when the eyeball was pressed directly backward. A roentgenogram made at that time showed slight increased density of the sphenoidal ridge on the left side. This was the first evidence of hyperostosis that appeared. Tumor of the orbit, probably meningioma, causing pressure on the left optic nerve, was diagnosed and transcranial exploration was advised.

It was decided that a transcranial approach¹ offered the best method for exposure and removal of the intraorbital tumor which was thought to lie behind the globe. Then, too, we could not be certain that the symptoms and signs were not the result of a meningioma of the sphenoid ridge, with secondary intra-orbital extension. In the event of such a

finding, the intracranial exposure would be essential.

Accordingly, a transfrontal approach, such as we use routinely for the exposure of pituitary tumors and other lesions about the optic nerves and chiasm, was employed. The scalp of the left frontal region was reflected and then a bone flap, with the temporal muscle as a hinge, was turned down. The dura mater was separated from the roof of the left orbit to the midline of the ethmoid bone and posteriorly to the free edge of the lesser wing of the sphenoid. The dura mater along the wing of the sphenoid was then incised in order to expose the left optic nerve, optic foramen, and superior orbital fissure. It was with difficulty that the intracranial portion of the optic nerve was exposed because of very dense arachnoidal adhesions about the nerve extending from the under surface of the frontal lobe and also from the tip of the temporal lobe. There were several dense adhesions extending from the diaphragm of the sella turcica to the mesial margin of the left optic nerve. These, we believe, were expressions of a reaction probably the result of hemorrhage from the tumor. A careful search revealed no evidence of an

¹Love, J. G. Transcranial removal of an intraorbital meningioma. *Proc. Staff Meet., Mayo Clinic*, 1935, v. 10, Apr. 3, pp. 213-215.

intracranial neoplasm. The posterior two-thirds of the roof of the orbit and the roof of the optic canal were removed with a rongeur after the placing of a burr hole in the roof of the orbit. The lateral wall and roof of the orbit lateral to the optic canal were much thicker than normal, and it was with difficulty that the periorbita was freed from the bone, the periorbita seemingly merging with the substance of the bone. The periorbita was discolored as if by an underlying vascular lesion. When this membrane was incised, a mass which felt not unlike an almond was discovered in the posterolateral portion of the orbit. The mass was found to be a vascular tumor with many thrombosed vessels and many clots in large varicosities. When one of the varicosities was punctured, an old blood clot extruded itself. The mass was fairly well encapsulated and when it was dissected free from the rest of the orbital contents, it was removed *en masse* (fig. 1). It was impossible to suture the incision in the periorbita because of tension. A Penrose cigarette drain was left under the frontal lobe and the craniotomy wound was closed in layers.

The drain was removed at the end of 48 hours. The patient made an uneventful convalescence and was dismissed from our care on the thirteenth day after removal of the intraorbital tumor (fig. 2).

The pathologic diagnosis of the tissue removed was hemangioma. One large vessel of the hemangioma contained an organized thrombus.

The patient returned for observation on November 24, 1938. She reported that she still experienced some dull ache in the left frontal area, but had no complaints referable to the eyes. Uncorrected vision of the right eye was 6/7, of the left eye, 6/20. Exophthalmometer readings at 99 mm. were 15 for the right eye and 16 for the left eye. Ophthalmo-

scopic examination of the left eye showed the retinal veins to be engorged, and there was marked arteriovenous compression indicating persistence of a venous obstruction that was insufficient to produce changes in the retina.

COMMENT

Hemangioma is the most common primary tumor found within the orbit. It occurs in several forms, of which the most common is the fibrohemangioma: an encapsulated, firm tumor containing large amounts of fibrous tissue with marked vascular proliferation; its blood supply is usually furnished by one pair of main vessels. Diffuse hemangiomas are more widely spread, are not encapsulated, and are supplied by anastomosing vessels. It is not uncommon to find cavernous areas in the diffuse tumors and, occasionally, thrombi. If thrombosis occurs, secondary degeneration with softening of the tumor may result, but more frequently, recurrent hemorrhages give cause for orbital exploration. Hemangiomas of the diffuse type occasionally exhibit slight pulsation, but the pulsation is not so distinct as that found in arteriovenous aneurysms. If pulsating angiomas lie near the bony wall of the orbit, erosion of the bone will occur, causing rarefactions that are apparent in roentgenograms. Very seldom does bony thickening occur except in the presence of inflammation. Hyperostosis of the sphenoidal ridge or the orbital plate of the ethmoid is commonly seen in meningioma, and constitutes one of the chief features of diagnostic value in that condition.

This case illustrates the fact that hemangiomas, even though rapidly developing, may produce hyperostosis of the sphenoidal ridge without extraorbital extension and that they may produce signs similar to those produced by meningiomas.

SOCIETY PROCEEDINGS

Edited by DR. H. ROMMEL HILDRETH

CHICAGO OPHTHALMOLOGICAL SOCIETY

November 21, 1938

DR. GEORGIANA D. THEOBALD, *president*

RETINITIS PIGMENTOSA

DR. H. A. KAVEN of the Illinois Eye and Ear Infirmary said that this colored boy, aged 11 years, was first seen on November 3, 1938, with a complaint of night blindness for three years and poor vision for five years. There was no history of consanguinity. The corrected vision was 20/50 in each eye. Fields in each eye showed small central islands of vision of 10 to 15 degrees; the tension was 23 mm. Hg (Schiotz). Externally the eyes were negative. Slitlamp examination showed normal findings. Extending peripherally from the discs many bone-corpuscle-shaped pigment deposits were seen about the vessels, with many irregular, pale areas. Lateral to and above the right macula was a small oval area with absence of retinal tissue, traversed by retinal vessels and choroidal vessels. The discs had a yellowish, waxy appearance. Physical and laboratory examinations were essentially negative.

PIGMENTARY DEGENERATION OF THE RETINA

DR. J. E. REEDER showed a white boy, aged 11 years, who gave a history of night blindness. There was no history of consanguinity. External examination of the eyes was negative. Vision was R.E. 20/30; L.E. 20/25, not improved by glasses. The fundus in each eye showed many floaters; veins and arteries were small. Pigmentation was seen only near the equator. The central fields in both

eyes were constricted to 5 degrees; color fields, both peripheral and central, only at the macula. Laboratory tests were negative.

BILATERAL OPTIC ATROPHY FOLLOWING INSECT BITE

DR. J. C. STRONG, JR., read a paper on this subject which was published in this Journal (August, 1939).

PULSATING EXOPHTHALMOS (three cases)

DR. H. SAUL SUGAR believed that two of the cases were probably due to rupture of the internal carotid artery into the cavernous sinus, while the third was an orbital arteriovenous aneurysm due to trauma.

Case 1. A white woman, aged 48 years, fell down a flight of stairs two years ago, following which she was unconscious for 14 days. Upon recovery she was annoyed by noises in the head, still present, and she also complained of the appearance of her right eye.

Examination: The corrected vision was 20/20 in both eyes. Tension in the right eye had always been above 26 mm. Hg, and on October 26 the tension was 35 mm. in the right eye and 22 mm. in the left. There was an exophthalmos of 23 mm. in the right eye, and of 16 mm. in the left. The right fundus showed dilatation of the vessels and a slight weakness of the right rectus muscle was noted. Diplopia was present for near due to an esotropia of 14 degrees and right hyperopia of 3 degrees for near only. This was homonymous, probably due to the exophthalmos. A bruit was heard over the head everywhere. Blood pressure was 120/80. X-ray studies of the skull were negative; those following intra-arterial

injection of thorotrast were unsuccessful. The visual fields were normal, and the neurologic examination was negative.

Case 2. A white woman, 71 years of age, noted a peculiar pounding sensation in her head five weeks ago. There was no history of trauma, stroke, or weakness of extremities. Three weeks ago the right lids began to swell, the eye protruded, and the upper lid drooped.

Examination: The corrected vision was R.E. 20/200; L.E. 20/70. Exophthalmos measured 27 mm. in the right eye, and 17 mm. in the left. The right palpebral fissure was 2 mm. in width, and could not be increased although the lid was easily closed. The left palpebral fissure was 11 mm. wide. Tension in the right eye was 25 mm. Hg, in the left 18 mm. The veins of the upper lid of the right eye were dilated and tortuous; the lower lid was everted by the chemotic conjunctiva. The conjunctival vessels were dilated and tortuous. The right eyeball was fixed in the primary position. The pupil of the right eye was fixed and dilated to 6.5 mm. due to pressure on the third nerve. The pupil of the left eye was normal, 4.5 mm. in diameter.

Slitlamp examination showed cortical lens changes in the left eye. Examination of the fundus of the right eye showed dilatation and tortuosity of the veins, increased diameter of arteries, and increased arterial reflex. Arteriovenous nicking was present. A flame-shaped hemorrhage was seen at the nasal border of the disc. The visual fields were normal. The corneal sensation of the right eye was diminished. Pulsation and bruit were present. The blood pressure was 170/90; the X rays of the skull were negative, as was also the blood Wassermann.

Case 3. A white boy, aged 9 years, was injured in the right orbit by a falling pitchfork seven weeks ago. One prong struck between the eyeball and the lateral

orbital margin on the right side. The eye proptosed rapidly with suffusion of blood under the skin of the lids. Corrected vision was 20/20 in each eye. Exophthalmos of the right eye was 22 mm.; of the left, 15 mm. The right palpebral fissure was 8 mm. wide; the left, 10 mm. The lids of the right eye showed a dilatation of the veins under the skin; there was dilatation of the episcleral vessels of the right eye, and the pupil was dilated and did not react to light. The fundus showed blurring of the disc margins and marked dilatation of veins. There was a bruit and thrill over the orbit. Third-degree fusion was present. The visual fields were normal, as also the corneal sensitivity. Tension was R.E. 26; L.E., 18. An X-ray study of the orbit was negative. Neurologic examination showed only the coincidental presence of pyknoleptic attacks.

THE SIGNIFICANCE OF OCULAR CHANGES IN PERSISTENT EXPERIMENTAL VASCULAR HYPERTENSION

DR. JOHN KEYES, Cleveland, Ohio, read a paper on this subject.

Discussion. Dr. E. V. L. Brown remarked that Dr. Keyes had called attention to vessel changes in the choroid, which were shown very beautifully. He noted a breakdown of pigment epithelium in front of the lamina vitrea in various places; possibly those places represented beginning detachments. If such detachments were extensive and old, one would have an explanation of the cataracts found. Choroidal-vessel sclerosis had not received the attention it probably deserves in albuminuric retinitis.

Dr. John Keyes (closing), in reply to Dr. von der Heydt, said that in the acute phase of hypertension, papilledema developed very rapidly and detachment of the retina was due to edema. He did not know what took place chemically. Hypertension alone did not produce the eye

changes seen in the acute phase; neither did uremia alone; but in dogs with hypertension and uremia, marked changes were seen in the eyes. One of the first hypertension dogs had intermittent evidence of renal failure, but only a unilateral transient papilledema was seen; however, this animal had persistent bilateral retinal edema. Cataracts occurred in some animals after they had had hypertension for many months. The retinal blood vessels and the eyes of these animals were diseased. It appeared that the same types of degenerative processes were common to the eyes of man and dogs. The eyes of these dogs aged rapidly. While it is known that cataracts occur in dogs, his observations had led him to believe that hypertension was an important factor in the etiology of cataracts in these dogs. One dog had bilateral glaucoma following massive intraocular hemorrhages. Corneal ulceration was secondary to absolute glaucoma, a condition frequently seen in man.

In reply to Dr. Brawley, Dr. Keyes said that a retinal artery and vein at an arteriovenous crossing are bound by a common connective-tissue sheath. Proliferation or edema of the tissue inside such a connective-tissue sheath would constrict the blood vessels therein, and the vein, being more easily constricted than the artery, would become notched. Undoubtedly, a sclerosed artery or arteriole could, and occasionally did, indent a vein, but he believes that arteriolosclerosis is not the only explanation of arteriovenous indentation or elevation.

REDUCTION OF POSTOPERATIVE COMPLICATIONS BY THE USE OF CORNEOSCLERAL SUTURES IN CATARACT OPERATIONS

DR. VERNON M. LEECH and DR. H. SAUL SUGAR said that records from the Illinois Eye and Ear Infirmary were examined and cases that fell into three

groups were tabulated: (1) Those in which no sutures were used; (2) those that had conjunctival sutures; and (3) those that had corneoscleral sutures. The number of postoperative complications in the first two groups were compared with the number in the third group in which operations were performed by the authors and their associates. Fewer complications occurred in the conjunctival-suture group and still fewer in the corneoscleral-suture group. The type of corneoscleral suture used in the majority of the cases in the third group was described.

Discussion. Dr. Thomas B. Allen thought Dr. Leech was to be congratulated on the very careful way in which he operated and made the postoperative dressing, and also for the collection of statistics that he and Dr. Sugar had prepared. He was impressed in again going over Dr. Jackson's article in a recent number of the American Journal of Ophthalmology. After having made a cataract incision, one had a flap in a rather elastic membrane; when the bandage was put on it was apt to press upon the cornea. In a cross section it could be seen how a bandage compressed it and dislocated the corneal wound so that it overlapped the scleral wound. That had several disadvantages: (1) It was one of the reasons for astigmatism against the rule. The cornea was flattened, causing a tore which had its axis in the vertical line. (2) A gaping was likely to occur because of the small amount of actual contact between the corneoscleral and corneal wound. (3) Hemorrhage might seep into the anterior chamber from the scleral edge. (4) Another disadvantage was the unstable closure of the wound, due to insufficient adherence, and any manipulations might displace the wound and cause freshly formed adhesions to become displaced.

It would be interesting to have appended to this report an analysis of Dr.

Leech's private cases. He and Dr. Fowler had been doing considerable work together, and had used these corneoscleral sutures in practically all cases for the past six or seven years.

Dr. Samuel Higgins called attention to a review of many forms of sutures illustrated in his thesis on "Closure of the cataract incision" presented before the Chicago Ophthalmological Society in 1930. The description of the suture he devised was published later in the Illinois State Medical Journal. The idea was original, although others might have used similar sutures which had not come to his attention. The first thought was to undermine the conjunctiva and attach a conjunctival flap to the cornea. The inadequacy of this procedure was mentioned and the firmer closure by including the sclera was referred to in the thesis. The suture was in effect a mattress corneoscleral suture with the threads parallel to the tangent of the limbus.

Dr. Leech's report was encouraging. Following the use of the mattress suture in several hundred cases, Dr. Higgins found the usual postoperative astigmatism to be $+1.00$ D. cylinder at approximately horizontal axis. It was not unusual to find the axis at or near 90 degrees. The latest cataract glasses he prescribed were $+12.00$ sphere with no astigmatism.

Dr. S. J. Meyer complimented Dr. Leech upon his presentation, but said that he felt there was an error in the statistics, inasmuch as the three series were done by different groups of operators. In comparing statistics the end results should be on eyes operated on by the same operator; it seemed unfair to compare those from various services, inasmuch as the efficiency of the operator varies.

In presenting the percentage of loss of vitreous and iris prolapse, was this at operation or postoperatively? Were there

many complications, or was the entire procedure uncomplicated? When was it necessary to insert sutures after operation? If there had been vitreous loss during operation, did he encounter a further loss when tying the sutures? Were there corneal infections following the use of black silk?

Astigmatism apparently varied according to the dexterity of the operator; the operator who made a good incision with little trauma usually encountered less astigmatism than the one who had difficulty. Any wound, whether in the abdomen or in the cornea should be approximated as closely as possible. In considering the problem of corneal incision he had wondered whether the amount of difficulty encountered in placing corneal sutures was greater than the disadvantages of the ordinary conjunctival suture with the conjunctival flap. In his private cases and on his service at the Infirmary corneal sutures had not been used, and the statistics as to iris prolapse compared very favorably with those of other operators. He believed, however, that there was a greater percentage of postoperative hyphemia than there should be, but no difficulty had been encountered in the use of one or two sutures in suturing a conjunctival flap; should the patient vomit, however, the conjunctival suture would not hold as well as might be desired.

Dr. Earle B. Fowler said that in the past year at least six patients had been operated on in which the physical complications were known to be severe. One patient was past 90 years of age; four had to be permitted to sit up; two had to be catheterized within 24 hours. In not one was there any delay in rapid closure of the wound. In all six the chamber was formed at the first dressing. This sort of result would make one favor the technique.

Dr. Vernon M. Leech (closing) said

that he believed these studies to be fair. Nine cases in the first series and six in the second were eliminated, and the cases in the corneoscleral group were taken as they came, eliminating none. In the summary shown on the screen, it would be noted that there was a vast reduction in the number of iris prolapses in the corneoscleral series; there were several cases of gaping wound in both the other groups. Dr. Meyer believed it would have been better had one man performed all the operations by various methods. Because these cases were collected over a period of approximately two years, and the residents and internes rotate between the various services, many of the patients in each group were operated on by the same men, the balance by attending men and associates whose surgical ability was considered to be equal. Had one man performed all the surgery, he probably would have found one method to which he was better adapted than others, and this might have varied his results accordingly. Therefore, the way in which these data were collected was as accurate as could be expected in a study such as this.

Loss of vitreous occurred in several cases at the time of operation, but none during or after the tying of sutures. The only difficulty experienced in suturing was the breaking of needles. If gripped too far from the point, the delicate needles were apt to snap, as too much leverage was used.

Infection developed in one case about three years ago and the eye was lost; why, he could not say. This study, however, covers immediate postoperative complications only.

He and Dr. Fowler started using corneoscleral sutures in private practice after an experience he had in attempting to make the old orthodox incision, preparing a conjunctival flap with the knife after sectioning the cornea. The bulbar

conjunctiva was of tissue-paper consistency and the knife slipped through it at the limbus, leaving no flap. It was necessary to undermine the conjunctiva covering the upper two thirds of the eyeball before it could be pulled over the wound, and even then there seemed to be considerable traction. The lens was delivered intracapsularly without mishap, then the conjunctiva was brought over the wound and held by two sutures. When the eye was examined the next day the sutures had pulled out. The conjunctiva had retracted away from the wound, which was gaping about 4 mm. with vitreous bulging through it. The patient was wheeled up to the operating room in bed and an effort was made to replace the conjunctival flap, without success. Some vitreous was lost in the attempt. The end result was an enormous amount of astigmatism, detachment of the retina, and vision of hand movements.

Robert von der Heydt.

NEW YORK EYE AND EAR INFIRMARY

OPHTHALMOLOGICAL DEPARTMENT

November 28, 1938

DR. SAMUEL P. OAST, *chairman*

EMBOLISM OF THE CENTRAL RETINAL ARTERY

DR. ISADORE GIVNER presented a case of a woman, aged 24 years. The history she gave stated that four years ago as she was opening a book, a cloud obscured the vision of the right eye. The doctor who saw her at that time diagnosed her case as an embolism of the central retinal artery. At the present time her vision in the right eye is the ability to count fingers at one foot. Four weeks previous to coming here her vision in the left eye disappeared. A diagnosis of central retinal embolism of the left eye was made at

this clinic. There was marked edema of the entire retina of the left eye and a typical cherry-red spot at the macula. A paracentesis was performed elsewhere, and injections of "Nitroscleran" were given. In four weeks the vision became light perception only. The patient was seen in the Weeks clinic after this, and a complete study including blood chemistry, X rays, and neurological examination was made. All tests were negative. It was decided then to give this patient injections of acetylcholine. After eight injections her vision was increased to 20/40 in the left eye. She has a cilio-retinal artery in the left eye. The question is whether the medication had anything to do with the return of vision, or whether the cilio-retinal artery developed collateral circulation. The visual field is larger in the right eye than in the left.

Three years after her first pregnancy, which was complicated by toxemia, she had a central retinal embolism of the right eye. Three years, almost to a day, after her second pregnancy, she again had a central retinal embolism of the left eye. She is now pregnant, duration about six weeks. The question arises, should this pregnancy be terminated? It would also be interesting to find out what is the blood concentration of acetylcholine during pregnancy. (Test for acetylcholine— eserine has inhibitory action on the acetylcholine.)

Discussion. Dr. Nathan Berger asked if the diagnosis was made only by Dr. Givner, to which Dr. Givner replied that he made diagnosis in part, and this was confirmed by others in the Weeks clinic.

Dr. Samuel P. Oast said that the patient now has a very marked atrophy, and asked Dr. Berger if he thought there might be another diagnosis for this case.

Dr. Berger replied that he has never seen a case with such a diagnosis improve vision to 20/40.

Dr. Sigmund Agatston said that he saw this patient's fundus when she first came to the clinic and that she had a typical case of embolism of the central retinal artery.

Dr. Vito La Rocca said that he had seen about three cases of embolism of the central retinal artery in the last four years. He found that with retrobulbar injections of acetylcholine all these patients improved. The acetylcholine was given every five days. One of the cases was followed in Dr. Key's clinic, and improvement was seen only after the use of injections of acetylcholine. Dr. La Rocca advised others to try acetylcholine.

Dr. Abraham Schwager asked if this patient had been treated with acetylcholine for the right eye. He said that apparently when treatment of this kind was given for the left eye it did some good.

Dr. Olga Sitchevska was of the opinion that the patient's pregnancy should be terminated at this time.

Dr. Clyde E. McDannald thought pregnancy had better be terminated. He felt that since she already has had toxemia in two previous cases, it is likely that she will have a toxic pregnancy again, and damage to what vision she has left may be done.

TYPHOID VACCINE FOR TRACHOMA PATIENTS

DR. NATHAN BERGER spoke on the use of typhoid vaccine as given to twenty-eight patients at the New York Eye and Ear Infirmary in the clinic of Dr. Clyde E. McDannald. He said that five minims of typhoid vaccine was given at weekly intervals, until the patient had received two cubic centimeters. Then one cubic centimeter was given at intervals of one month. During the acute stage the patient received argyrol for two or three weeks, and then zinc sulphate. The patient also must coöperate, and get from

eight to nine hours of sleep a night, and have a balanced diet. Cases of trachoma with pannus and ulcerations have also been included in the number treated. The only patients not treated were those with trichiasis. In all cases in which typhoid vaccine was given, the patient felt much better after the second or third injection.

Previously most trachoma cases had been treated with copper sulphate, argyrol, silver nitrate, and hot applications. The typhoid vaccine injections are given subcutaneously once a week. Improvement usually starts at the end of 48 hours. Patients have a febrile reaction, but not enough to be noticed. Patients do not have to be confined to bed, and there are no dangers involved in the use of the vaccine. In the 15 to 18 years that Dr. Berger has been using the typhoid vaccine he has seen only one or two cases in which there was an unfavorable reaction. At the same time that the vaccine is used for therapeutic measures, the patient is immunized for typhoid. Patients with fever or cardiac insufficiency should not get this treatment. Of the 28 cases treated by this method, the results were favorable in 26.

Discussion. Dr. Samuel P. Oast said that we have always thought of trachoma as intractable to all treatment until now, but recently sulfanilamide and typhoid vaccine have been used with some degree of success.

Dr. Sigmund Agatston said that short-wave diathermy has been used in trachoma cases with some result also, since this method increases the temperature of the patient.

Dr. A. L. Kornzweig asked if fresh cases of trachoma had been treated by this method, and Dr. Berger replied that two such cases were treated by him. One patient has been under his care for two years. After the first two weeks she has had no real difficulty with her eyes. At

home she used zinc sulphate. This patient never had a pannus.

Dr. Isadore Givner did not feel that Dr. Berger had proved his case, since he thought that follicles might be present in cases of acute conjunctivitis, and, if a pannus was never present, he did not think that such a case was a case of trachoma. He added that in the United States we have very few cases of fresh trachoma, and what we usually see is acute flareups of trachoma cases. He thought that Dr. Berger was probably curing superimposed conjunctivitis in trachoma cases.

Dr. Nathan Berger answered that in the cases in which there is no pannus, diagnosis may be difficult. In the cases presented, however, other doctors in the clinic had concurred in the diagnosis. If a case of "acute trachoma" clears up in two to three weeks, you may be sure that the case is not trachoma. If you give treatment to a patient for three or four weeks, however, then you know that it is either a case of trachoma or follicular conjunctivitis. In cases in which there is vascularization of the cornea there seems to be no doubt that the condition is trachoma.

Dr. Olga Sitchevska said that in the Ural Mountain region of Russia where 20 percent of all patients had trachoma, the literature reports that treatment with expression of follicles has been given every six weeks with success, and that no treatment is necessary at home. Cures have been effected in about one year.

RETINITIS STRIATA

DR. OLGA SITCHEVSKA presented a case for differential diagnosis. The patient, R.K., aged 35 years, was first seen six months ago complaining of blurred vision in the right eye for the past month. There was no history of injury nor in-

flammation of the eye that he remembered. Externally the eye was negative. Lens changes were seen in the right eye, and a few vitreous opacities. The striking feature was the changes in the fundus of the right eye. Below and above the disc were a number of white-yellowish lines which branched and extended towards the temporal side; over these striae unchanged retinal vessels passed; at many places in relation to the striae, there was accumulation of pigment. One small hemorrhage was seen below the macular region. Vision of 20/30 was obtained with a -1.50 D.sph. ≈ -0.50 D.cyl. ax. 60° . The left fundus presented a small myopic conus and the vision equalled 20/30 with -6.50 D.sph. ≈ -0.75 D.cyl. ax. 160° . The blood Wassermann and blood chemistry were negative. The fields were contracted from 20 to 30 degrees, with a paracentral scotoma on the nasal side.

Dr. Sitchevska said that the first impulse would be to think of a rupture of the choroid, but the lines are too numerous, there is no history of an injury, and the rupture of the choroid is generally of crescentic shape and parallel to the disc on the temporal side. Oatman has called this condition retinitis striata. He regards it as the residue of hemorrhages which occurred either during birth or in early infancy. Fuchs states that this type of fundus is improperly called retinitis striata. He believes this condition to be due to reattachment of a detached retina. Angioid streaks are dark, they radiate from a more or less annular streak situ-

ated near the disc and encircling it. They are deep in the retinal-vessel area, and are possibly due to pigment derived from an old hemorrhage.

In our case, in view of the presence of vitreous opacities and changes in the lens, some inflammatory process might have been going on in early infancy in both the choroid and retina.

Discussion. Dr. Sigmund Agatston said he noticed a pigmented streak that looked like a rupture of the choroid, and in the periphery there seemed to be a little detachment which had become reattached up to a certain point, and presented a picture of rupture of the choroid with reattachment and development of retinitis striata. The history does not militate against the diagnosis, because the patient does not remember whether or not there was any early history of trauma.

Dr. Clyde E. McDannald asked how one could rule out an inflammatory condition, and Dr. Agatston replied that the patient had had a vitreous hemorrhage and other signs of inflammation are absent. No particular spot shows definite inflammation. Associative detachment in retinitis striata with proliferans would also show this to be traumatic. Fundi like this are seen in prize fighters.

Dr. A. L. Kornzweig agreed with Dr. Agatston. He thought that the original injury might go as far back as birth. The linear formation of the pigmentation would be in line with such a diagnosis.

Donald W. Bogart,
Secretary.

AMERICAN JOURNAL OF OPHTHALMOLOGY

Published Monthly by the Ophthalmic Publishing Company

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ASTIGMATIC VARIATIONS

Our patients often find it difficult to understand why the great majority of human eyes deviate in some degree from the normal. But the remarkable fact concerning the optical variations between different human eyes, and also in the same eye at different ages, is not that departures from normal or emmetropic measurement are found but that these departures are so relatively small.

A variation of one millimeter in the length of the eye will usually amount to a difference of about three diopters in spherical refraction. A slight flattening of one meridian of the cornea in relation to the opposite meridian, quite undetectable to common inspection, may correspond to an amount of astigmatism

which, unless corrected with a spectacle lens, greatly disturbs or even incapacitates the patient. According to Tscherning, a change of 0.18 mm. in the radius of corneal curvature is sufficient to create one diopter of astigmatism in an eye which had a normal radius.

Many of us in our own persons have experienced fairly frequent changes of refraction, especially as to astigmatism. The rapid changes of progressive myopia are well known. More moderate changes may be almost equally important to the patient, whether in school life or in adult occupations. A low hyperopic astigmatism in youth may be gradually replaced by a much higher amount of myopic astigmatism.

In the young adult, extreme astigmatic

changes suggest pathological variations in corneal curvature, and in the elderly person there will be a suspicion of modified lenticular structure pointing toward cataract. In the latter case an important change of correcting lens may exceptionally be necessary every month or two over a period of a year or more, although with retention of good visual acuity. We are all familiar with the refractive disturbances produced by diabetes, pterygium, corneal injury, and severe corneal ulceration.

Some years ago, Ellett (Section of Ophthalmology of the American Medical Association, 1926, page 261) reviewed the general subject of refractive changes as encountered in daily practice. Alterations, he pointed out, may occur in the diameter of the eyeball, in the refracting curvatures of the ocular media, in the density of the media, and in the behavior of the ciliary muscles. Normally, the rather high hyperopia thought to exist in all newborn infants diminishes until the eye attains its full size at about the sixteenth year. Ellett gave a number of examples (in childhood, adolescence, and adult life) of lessening of hyperopia, increase of hyperopia, progressive myopia, changes in astigmatic strength and axis, and so-called spasm of accommodation.

The subject of astigmatic variations has been studied by a number of writers, including Jackson, who called special attention to the frequency with which astigmatism with the rule becomes astigmatism against the rule in later life; and Zentmayer, who concluded that the general tendency was toward an increase in static refraction and an increase in astigmatism.

Rössler (Klinische Monatsblätter für Augenheilkunde, 1939, volume 102, page 176), after an exhaustive review of ten years' experience with the cobalt lamp (which he still regards as one of the most

sensitive refractive tests), calls attention to rapid and puzzling astigmatic variations which the cobalt test has shown beyond possible doubt. An excellent example is the case of a man of thirty-five years, who five years earlier had been given for the right eye $+3.50$ D. sph. $\approx +2.00$ D. cyl. ax. 22° ; and for the left eye $+4.00$ D. sph. These he had worn comfortably until he suddenly experienced pain over both eyes, followed next day by a decided reduction in vision. A new measurement under homatropine gave: right eye, $+3.00$ D. sph. $\approx +0.75$ D. cyl. ax. 15° ; left eye, $+3.00$ D. sph. But three days further preparation with atropine was required before a persistent distortion of the color image (apparently due to accommodative spasm) could be overcome, with a return to the original astigmatic measurement for the right eye.

Rössler mentions that he himself has for years experienced fugitive attacks of blurred vision, both for distance and near. At such times the image produced by the cobalt lamp is distorted and confused, so that an accurate refractive estimation is hardly possible. The attack passes off in fifteen or twenty minutes. The essayist is disposed to attribute this occurrence to an intracapsular displacement of tissue such as was described by Stanka and later by Vogt. Rössler does not regard mere accommodative cramp as sufficient explanation for such disturbances.

The writer of the present editorial comment has at times found himself completely baffled by patients who showed a definite change of refraction, of important amount, in the course of a few days. In at least one such case the vision obtained with the first correction was excellent and the measurement quite definite while it lasted; and after the change had occurred the vision yielded by the first correction was poor and that obtained with the radically different second cor-

rection was good. In other cases there has been a sudden and definite modification of the astigmatic axis, with later return to the original axis; both examinations being made by the same technique. Temporary obscurations of central vision, without definite loss of a part of the visual field, may arise from allergic influences, being perhaps analogous to, although distinct from, the phenomena of migraine.

Experiences of this kind should bring home to the refractionist that, no matter how careful his technique, his examination and prescription may have produced an unsuitable result and therefore need to be reconsidered. Without exaggerated humility, we may always regard our findings as fallible. We may even find it practicable to use this consideration as a basis for indulgence toward the apparent mistakes of our colleagues.

W. H. Crisp.

SOME SAFETY FACTORS IN CATARACT EXTRACTION

Just a few years ago America was visited by Dr. Elschmig, who lectured on the subject of cataract and gave demonstrations of methods of extraction of the lens. Perhaps the most striking feature of his operations was the meticulous care that he exercised in the toilet of the wound, especially in replacing the iris pillars and removing any capsule remnants in cases in which the capsule had been ruptured. This procedure required a longer time than all the rest of the operation. Clearly Dr. Elschmig thought that the exact closure of the wound was a primary requisite for a good result.

In this issue of the *Journal* appears a fine article by Drs. Terry, Chisholm, and Schonberg on the epithelization of the anterior chamber. This, to be sure, is only one, and a very rare, complication of the cataract operation. However, every pos-

sible cause for surgical failure must be considered and eliminated or reduced to the minimum. These authors point out that the factor particularly conducive to the production of this unfortunate accident is primarily a wound that has failed to close. Such implantation of epithelium might result if the conjunctiva is tucked within its edges, or fragments of iris or capsule tags remain in the incision. It therefore behooves the surgeon to be certain that none of these conditions exists at the close of the operation. The surgeon is apt to feel so satisfied and mentally relieved at this point, if all has gone well, that he is eager to close the lids as quickly as possible and not give due time to what may seem to be a relatively unimportant step.

Another possible factor in epithelization of the anterior chamber brought out by the authors is the absence of corneal endothelium in every case in their series. Whether or not this is really a causative element, it is obviously very desirable to protect the endothelium. Its destruction may have a bearing on such unfortunate sequelae as the formation of a glass membrane in the anterior chamber, edema of the cornea, and so forth. To avoid destruction of endothelium it is wise to limit manipulation within the eye to a minimum, and particularly to avoid the injudicious irrigation of the anterior chamber. This may be performed during the operation at any time that this chamber fills with blood, but the procedure should be carried out with the greatest circumspectness. The pressure under which the fluid is introduced should not exceed the minimum necessary to produce the result. If the cornea near one end of the wound is elevated slightly and the nozzle is introduced near the other end, much less pressure is necessary to wash out the blood. The matter of the temperature of the irrigating fluid is also of great

importance. It is rather difficult to maintain the proper temperature, but mechanics can be arranged to accomplish this fairly accurately.

It is obvious that for quick, uninterrupted wound healing not only is it necessary to have the lips of the wound in close approximation but also to have a smooth, clean-cut incision. As Jackson has pointed out (*American Journal of Ophthalmology*, 1938, volume 21, number 9, page 1012), the incision used most frequently at present has been developed from the time of Daviel, who made an incision of the cornea with the lancet and enlarged it with scissors from each side. There is no room for argument with the statement that the cataract knife makes the best section when handled by an expert. The difficulty is that there are too few experts, and the section itself physically and psychologically is perhaps the most difficult procedure in surgery. To make the perfect section the hand must be steady and the eye must watch two points that are 13 to 14 millimeters apart at the beginning of the procedure. It is very difficult to watch these points as the knife is sawed upward. One or the other end of the incision is apt to be too deep or too shallow. As the knife advances there is always danger of iris prolapse on the blade, and finally the knife is apt to emerge too far forward or too far back.

If ophthalmologists operated daily or even two or three times a week they would have no difficulty. Unfortunately there is not enough eye surgery. Surely most ophthalmologists do not operate enough to keep their hands in training. This appears to the younger man to be the glamorous part of ophthalmology, but it is rare that he acquires an adequate surgical practice before middle life and then he does not have too long to enjoy it. Psychologically the situation is difficult

because the surgeon knows the importance of the section and the need of a steady hand. A little too much pressure with the forceps, a little too much dragging with the knife and vitreous escapes and the surgeon is in serious difficulties. This knowledge interferes with the surgeon's best accomplishment.

There are many things to be said in favor of a keratome incision, after a small conjunctival flap has been laid down, and its enlargement with scissors: It is simple to perform; the danger of an accident during the section is reduced to a minimum; the section is placed exactly where it is wanted, neither too far forward nor too far back. True enough, the outer wings of the wound are somewhat crushed by the scissors, but this does not seem to interfere materially with wound healing, and the consideration of the simplicity of the procedure may well counterbalance this disadvantage for the occasional operator. By a shift to this method I have seen confidence restored in surgeons who had previously been defeated by nervousness over the section. This method, although not advocated as the best for every operator, certainly is one that should be carefully considered by those to whom cataract surgery presents a psychological problem.

Lawrence T. Post.

BOOK NOTICES

TRAITÉ D'OPHTALMOLOGIE.

Published under the auspices of the French Ophthalmological Society by P. Bailliart, Ch. Coutela, E. Redslob, E. Velter, R. Onfray. In 8 volumes, 8,058 pages, 3,247 figures, 176 colored plates (17 x 25 cm.). Paris, Masson et Cie, 1939.

Volumes 1 and 2 were published on May 23, 1939, volumes 4 and 5 on June

23, 1939. Volumes 3 and 6 will appear on October 27th, and volumes 7 and 8 on November 24, 1939.

To the French-reading ophthalmologist the appearance of the first two volumes of the *Traité d'Ophthalmologie* is an exciting event. Sponsored by the French Society of Ophthalmology and under the direction of its capable editors, its authority should be unquestioned. The list of names of the collaborators is an impressive one, composed as it is of distinguished ophthalmologists, anatomists, physicists, physiologists, chemists, and neurologists. Each is a competent authority on the subject of which he writes.

The volumes are attractively bound in black cloth with gold lettering, and green and gold modernistic design. The paper is of good quality, the type of adequate size, and the illustrations for the most part clearly printed and pertinent. The colored plates are well executed, but do not equal those in the *Kurzes Handbuch*. A valuable feature is the appearance, at the top of each page, of a bracketed page number of the bibliography to be found at the end of each chapter.

The editors and publishers are to be congratulated upon their splendid achievement. The treatise will replace the French encyclopedia of ophthalmology, which for more than 30 years has been the standard work of reference in French. The many additions to our knowledge during these years have been incorporated in the modern work and are available not only to the student but for the practicing ophthalmologist in search of finer details.

A general index of the material to be found in the entire treatise and in each volume is found in volume 1. In addition an alphabetical index of such material will be found in the last volume.

Volume 1 (1,042 pages) consists of chapters on the history of ophthalmology

(by H. Villard), embryology (by G. Le-Plat, Ch. Dejean), anatomy (by G. Winckler, G. E. Jayle, E. Redslob), neuro-anatomy (by J. Lhermitte, P. Van Gehuchten, Cerise and Thurel, A. Tournay), comparative anatomy and physiology (by A. Rochon-Duvigneaud), heredity in ophthalmology and teratology (by M. Van Duyse). It is difficult to single out those parts most distinguished, but certain of the material struck the reviewer as worthy of attention. The chapter on the history of ophthalmology is, of course, cursory and the reader is referred to the works of Hirschberg and others for more detail. The illustration, however, will repay investigation even by those unable to read French. Professor Le Plat's chapter on the general development of the visual apparatus is well written and illustrated. Dejean discusses the detailed embryology of the various parts and also devotes a valuable chapter on comparative anatomy in the phylogenetic animal series. Winckler adequately handles the anatomy of the orbit and ocular adnexa, Jayle that of the lacrimal apparatus and ocular blood vessels. Redslob's work on the macroscopic and microscopic anatomy of the eyeball is perhaps the most outstanding of the contributions to volume 1. His chiseled phrases and paragraphs illuminate every page. The illustrations are well chosen and clear cut; for example, those of the lens and suspensory ligament. Professor Jean Lhermitte of Paris discusses the anatomy of the optic pathway, on which he is one of the most important modern authorities. A trivial improvement, however, would be the more detailed labeling of his photographs of brain sections. In addition he seems to have overlooked Poliak's work, particularly that on macular representation. Professor van Gehuchten of Louvain, whose chapter on the anatomy of the oculomotor pathways is

most noteworthy, has, as is well known, revolutionized our knowledge of the anatomy of the nucleus of the oculomotor nerve.

Cerise and Thurel describe the anatomic pathways of ocular sensibility, and Tournay those of the sympathetic and parasympathetic in detail, revealing facts that are not as a rule to be found gathered together in one place.

Rochon-Duvigneaud's contribution on the comparative anatomy and physiology is complete and well illustrated. It should be of particular value to experimental ophthalmologists.

VanDuyse's work on heredity and teratology completes the volume. He has written much on congenital ocular defects in the past and for this reason is a master of his subject. Much of the recent work along this line, particularly that of the English and American authors, has apparently escaped his attention.

Volume 2 (1,142 pages) covers the physiology and methods of ocular examination. Approximately a fourth of the volume is devoted to the physiology of the eyeball as a whole, to which Professor Magitôt contributes the major portion. Bailliart's chapter on nutrition and circulation of the eye is well executed, as is to be expected. Rollin writes on the conjunctival circulation and his article is particularly well illustrated with colored plates. Jean Nordman's chapter on the physiology of external ocular motility is one of the high spots of this part of the volume. It is clearly expressed and well illustrated with charts and diagrams. Cerise and Thurel discuss the sensitivity of the eyeball and the methods of investigation. This subject is, as a rule, not sufficiently covered in most books on physiology.

Émile Haas, Assistant in Physics to the Faculty of Medicine of Paris, contributes a well-written and illustrated

chapter on Theoretic and applied optics, expressing the formulae in both geometric and logarithmic terms. Joseph's chapter on Physiologic optics is short, but apparently covers the ground sufficiently. Biologic optics is an entirely new chapter in ophthalmology. LePlat, under this heading, writes on the absorption and action of radiant energy on the ocular tissues. Viallefont discusses Entoptic phenomena. Magitôt writes a chapter on the modification of the retina under the influence of light, devoting considerable space to action currents.

Professor Piéron discusses the physiology of vision, under various headings; such as, visual stimulation, visual excitation and the theories relative to its mechanism, and visual sensation and perception. The modern work along these lines is well represented.

L. Opin of Toulon contributes the chapter on binocular and spatial vision, from the physiologic point of view. It is well written, conservative, and sensible.

Under the division in volume 2 on "Les techniques" is described the methods of ocular examination, instruments and apparatus used, trial frames, test charts, skiascopy, perimetry, scotometry, tonometry, and so on. It is gratifying to see John Eváns's work on scotometry so well described and obviously well thought of. The contributors to this portion of volume 2 are Lemoine, Valois, Joseph, Haas, Dubois-Poulsen, Dubar, Rollins, Mawas, Hartmann, Dollfus and Veil.

DERRICK VAIL.

THE COLLECTED PAPERS OF
JOHN MARTIN WHEELER, M.D.,
ON OPHTHALMIC SUBJECTS.
Prepared for publication by the staff
of the Institute of Ophthalmology of
the Columbia-Presbyterian Medical
Center. Clothbound, 431 pages, illus-

trated. New York, Columbia University Press, 1939.

A volume of the collected papers of Dr. John Martin Wheeler has recently been published under the auspices of the staff of the Institute of Ophthalmology of the Columbia-Presbyterian Medical Center. This book is valuable for the intrinsic merit of the articles that it contains and as a fine memorial to the author. Though Dr. Wheeler's contributions were not very numerous, they all had real merit.

Those having to do with plastic surgery are probably the most interesting and make up about half of the volume. This was the field in which Dr. Wheeler particularly excelled, and his papers contain many practical suggestions, all of them clearly and simply stated. Any subject that he handled was clarified in the handling. He had a gift for clear and illuminating discussion. Much credit should go to those who conceived and carried out the idea of this volume.

Lawrence T. Post.

WORTH'S SQUINT OR THE BINOCULAR REFLEXES AND THE TREATMENT OF STRABISMUS.

By F. Bernard Chavasse. Edition 7, Clothbound, 688 pages, 225 illustrations. Philadelphia, P. Blakiston's Son & Co., Inc., 1939.

The author, through a study of ocular developmental anatomy together with a study of the development of binocular reflexes in children, quite logically argues that all variations of squint appear to be perversions or subversions of the normal binocular reflexes by various obstacles operative during and after the developmental period.

When the normal reflexes are blocked, a new secondary reflex immediately begins to form that has the same degree of early mutability and later fixity as a normal one of equal age. Thus the abnormal

reflex may not merely displace the normal one but replace it.

Applying this reasoning to corresponding and noncorresponding retinal points, the author states that when a patient with strabismus is old enough to cooperate sufficiently to allow a diagnosis of secondary retinal correspondence to be made, the abnormal reflex is so firmly fixed that it is practically impossible to remove it by any of the known methods of orthoptic training.

If the squint is of the intermittent variety, the eyes may be straightened by almost any method and especially by glasses and time. This type, he states, is the only type that can be cured by stereoscopic methods, regardless of the name of the instrument used or the method employed.

In order to handle a strabismus case properly, it is most important that a correct diagnosis be made. Ideally, the patient should be an infant or a child whose eyes have only recently crossed. If the squint is monocular the fixating eye should be occluded until there is perfect or almost perfect alternation of fixation.

Glasses should be ordered if indicated. As long as there is any deviation of the visual axes, binocular vision should be prevented by the occlusion of the eye habitually used for fixation.

If the eyes are not straight after a month of occlusion and the wearing of glasses, prompt surgical correction is indicated.

The author undoubtedly feels that orthoptic training as practiced today is not only worthless in the majority of cases but in some cases may actually help to establish more firmly an already present secondary retinal correspondence.

The chapter on choice of operation is especially interesting. The technique of several of the author's favorite operations is given in detail. W. H. Meinberg.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

ASSISTED BY DR. GEORGE A. FILMER

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

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| 1. General methods of diagnosis | 10. Retina and vitreous |
| 2. Therapeutics and operations | 11. Optic nerve and toxic amblyopias |
| 3. Physiologic optics, refraction, and color vision | 12. Visual tracts and centers |
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| 9. Crystalline lens | 18. Hygiene, sociology, education, and history |
| | 19. Anatomy, embryology, and comparative ophthalmology |

1

GENERAL METHODS OF DIAGNOSIS

Bedell, A. J. The newest model of the Nordenson-Zeiss photographing ophthalmoscope. *Trans. Amer. Ophth. Soc.*, 1938, v. 36, p. 278.

The modified Nordenson photographing ophthalmoscope uses a 7.2 ampere 12-volt nitra bulb instead of an arc lamp. The new bulb gives a U-shaped light instead of a sharp band, a disadvantage in cases where the pupil is less than 6.5 mm. in diameter.

David O. Harrington.

Danis. Photography of the anterior segment of the eye. *Bull. Soc. Belge d'Ophth.*, 1938, no. 77, p. 17.

The writer describes briefly his method of photographing the anterior segment of the eye in colors.

J. B. Thomas.

Goede, M. Roentgen photographs of the skull in eye diseases (especially calcification of the internal carotid). *Klin. M. f. Augenh.*, 1939, v. 102, May, p. 651.

In 42 of 120 roentgen photographs of skulls of persons over fifty years of age

with different eye diseases, Goede found calcification of the internal carotid. In about 40 percent of the cases of very marked general arteriosclerosis, especially of the retinal vessels, no calcification of the carotid was found. This would indicate that a relationship between arteriosclerosis of the basal cerebral arteries and that of the peripheral (retinal) vessels need not exist. Roentgen findings of a calcified internal carotid do not necessarily indicate direct damage to the optic nerve by compression, but disturbances of circulation and subsequent lesions of the optic nerve may be assumed. In all affections of the optic nerve the roentgen picture is an important diagnostic aid and it ought always to be taken when vascular disease is suspected.

C. Zimmermann.

Karbowski, Mieczyslaw. The diagnostic significance of color fields. *Klinika Oczna*, 1939, v. 17, pt. 2, p. 187.

The author believes that the diagnostic significance of color fields is underestimated, and the test undeservedly neglected. The white fields offer a

quantitative measure of the pathologic process, while the color fields reveal qualitative indications relative to its seat and course. The uniform size of the colored objects does not give an accurate picture of color perception, because color perception is not identical for all wave lengths. In order to determine the size of colored stimuli of the same physiologic intensity, the author conducted a series of tests on the clinical personnel. The findings show that in order to use physiologically equivalent test objects, the blue should be 5 mm., the red 2 mm., and the green 4 mm. in size. Fields of retrobulbar neuritis with the usual test objects and with physiologically equivalent test objects demonstrate that the latter bring out pathology which is not indicated in the fields taken in the usual way. (Visual fields.) Ray K. Daily.

Kleefeld, G. Clinical exploration of the eye with binocular microscope and ophthalmoscope, utilizing polarizing filters. *Bull. Soc. Belge d'Opht.*, 1938, no. 77, p. 50.

The writer reports the results of two years of personal research in examining eyes with the help of polarizing screens or filters. He regards the use of these screens as the most important aid to ophthalmoscopy and biomicroscopy since the construction of the slitlamp. In examining the fundus with polarized light the retinal vessels show well-developed lymphatic sheaths in certain vascular groups. The least swelling of the retina is remarkably clear. It is noted that in senile degeneration of the macula the lesion is always cystic in nature, the deposits of exudate occurring deep within the cyst but clearly visible with polarized light. In examination of the cornea, lens, and fundus the absence of light reflexes is

of obvious advantage. The text is illustrated by eleven excellent photographs, some of which show very clearly the contrasts between retinal defects as observed by natural and by polarized light. J. B. Thomas.

Krimsky, Emanuel. A featherweight slitlamp. *Arch. of Ophth.*, 1939, v. 21, June, pp. 1033-1035.

The slitlamp consists of a lens housing made of duralumin, at one end of which is a lens mount containing an improved Zeiss 10-X double aplanatic lens, and at the other a channel making a 45-degree angle with the focal axis which holds the lamp unit. An automatic device permits changing the beam progressively from a vertical slit to a transverse one and finally to a homogeneous circle of light. An attachment can be added to clamp the instrument over the eyeglass. (Photographs.) J. Hewitt Judd.

Krimsky, Emanuel. Focusing magnifier attachment. *Arch. of Ophth.*, 1939, v. 22, July, p. 110; also *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1938, 43rd mtg., p. 403.

This consists of a collar through which a pen-type flashlight can be slipped, a connecting bracket, and a lens mount which has incorporated in it a 6-X double aplanatic lens (Photographs.) J. Hewitt Judd.

Lijo Pavia J. Moving pictures of the eye. *Rev. Oto-Neuro-Oft.*, 1938, v. 13, Nov., p. 241.

The author gives a comprehensive review of this subject. The indications, advantages, apparatus, and technique of motion-picture photography as applied to ophthalmology are fully covered, with illustrative examples. Of particular interest are the study of pul-

sations of the retinal vessels by the author's methods and the technique of color photography of the retina.

Edward P. Burch.

Riwchun, M. H. **A substitute for the Hildreth lamp and a new use for both.** *Amer. Jour. Ophth.*, 1939, v. 22, July, p. 778.

Sloan, L. L. **Instruments and techniques for the clinical testing of light sense. 1. Review of the recent literature.** *Arch. of Ophth.*, 1939, v. 21, June, pp. 913-934.

After reviewing the literature, the author points out that a number of problems require investigation before the test of the light sense will be of much clinical value. Chief of these are standardization of variable factors; discrimination of regional variation in light sensitivity; studies of the light sense in different pathologic conditions, especially those other than glaucoma and vitamin-A deficiency; and the range of variation in normal eyes and determination of the borderline between normal and pathologic sensitivity.

J. Hewitt Judd.

Sloan, L. L. **Instruments and techniques for the clinical testing of light sense. 2. Control of fixation in the dark-adapted eye.** *Arch. of Ophth.*, 1939, v. 22, Aug., pp. 228-232.

A luminous device for fixation of the dark-adapted eye is described. It consists of a modification of the luminous fixation target of the Ferree-Rand perimeter in which the neutral filter is replaced by a red filter. The blind spot is used as an indicator of any deviation of fixation. Since this type of fixation target cannot be used for making tests of light sensitivity at the fovea, a perifoveal fixation target composed of four

spots of luminous paint was devised. The author's studies demonstrate that the technique used by Ferree and his coworkers and by Derby and his coworkers does not measure the light sense of the central portion of the retina.

J. Hewitt Judd.

Sloan, L. L. **Instruments and techniques for the clinical testing of light sense. 3. An apparatus for studying regional differences in light sense.** *Arch. of Ophth.*, 1939, v. 22, Aug., pp. 233-251.

An instrument to test the light minimum in photopic and scotopic vision and the rate of dark adaptation is described. The salient features of this apparatus are fixation devices and a movable stimulus, permitting tests of the fovea and of any desired regions of the paracentral and peripheral portions of the retina. The author reports the results of light-sense studies in the normal eye, and preliminary studies on patients with idiopathic flat detachment of the macula, pigmentary degeneration of the retina, primary atrophy of the optic nerve, tryparsamide amblyopia, and vitamin-A deficiency. These show that different forms of ocular pathologic conditions may be associated with deficiencies in sensitivity of light which differ qualitatively as well as quantitatively. The defects may be localized, or may affect the entire retina. They may or may not affect photopic and scotopic visions equally. It is also conceivable that the light sensitivity could be normal in both light and dark adaptations with abnormalities only in the rate of dark adaptation.

J. Hewitt Judd.

Thomson, A. M., Griffith, H. D., Mutch, J. R., Lubbock, D. M., and others. **A study of diet in relation to health. Dark adaptation as an index of ade-**

quate vitamin-A intake. 2. A new photometer for measuring rate of dark adaptation. *Brit. Jour. Ophth.*, 1939, v. 23, July, pp. 461-478.

The technique for using the new photometer in measuring rate of dark adaptation is elucidated. The advantages of the apparatus described over similar devices are presented. Its routine use for children is especially recommended. (Tables, references.)

D. F. Harbridge.

Vogt, Alfred. Practical value of arteriography for ophthalmology. *Klin. M. f. Augenh.*, 1939, v. 102, May, p. 641.

Three successful cases of the brain surgeon Kraysenbühl illustrate the value of encephalo-arteriography. The method consists in making the arteries of the brain opaque to roentgen rays by injection of colloidal thorium dioxide (thorotrast) into the carotid. In London Kraysenbühl saw two fatalities from thrombosis of the carotid occurring about two months after injection of thorotrast, but he has had no deleterious sequelae in his series of about forty cases in the surgical clinic at Zürich. The cases reported are an aneurysm of the left internal carotid in the middle cranial fossa, and one of the right internal carotid which pressed on the right oculomotor and trigeminal nerves. These were completely cured by operation. A case of traumatic pulsating exophthalmos is also described. The aphasia and hemiparesis after ligation of the common carotid later disappeared and vision became normal.

C. Zimmermann.

2

THERAPEUTICS AND OPERATIONS

Gookin, E. R. New instruments for ocular operations. *Arch. of Ophth.*, 1939, v. 21, May, pp. 853-854.

The first consists of two squint hooks which may be used individually or in combination to form a muscle clamp. The second is a needle guide to prevent any laceration of tissue during the process of suturing. The third is an improved spatula. (Illustrations.)

J. Hewitt Judd.

Guyton, J. S. The use of sulphanilamide compounds in ophthalmology. *Amer. Jour. Ophth.*, 1939, v. 22, Aug., pp. 833-850.

Heath, Parker. Use of emulsions in ophthalmology. *Amer. Jour. Ophth.*, 1939, v. 22, Aug., pp. 904-905.

Karbowsky, M. Iontophoresis in ophthalmology. *Ophthalmologica*, 1939, v. 97, June, p. 166.

The author gives an extensive quantitative analysis of the characteristics of the current used in iontophoresis and of its effects. He surveys the literature and reports his own observations made during the past ten years. Iontophoresis often enables one to attain success when other medical means have failed. Its action surpasses many times the effect of the introduction of remedies into the conjunctival sac and even subconjunctivally. The ions of calcium, potassium, adrenalin, atropine, and pilocarpine act on the vegetative nervous system. The ions of zinc, iodine, salicylic acid, and phosphorus act chemically.

F. Herbert Haessler.

Krimsky, Emanuel. Battery-driven corneal burr. *Arch. of Ophth.*, 1939, v. 22, July, p. 111; also *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1938, 43rd mtg., p. 402.

The instrument consists of a generator operated by two batteries attached to a cylindric collar into which may be

inserted any of the standard dental burrs. (Photograph.) J. Hewitt Judd.

Lombardo, M. A toothless iris forceps. *Amer. Jour. Ophth.*, 1939, v. 22, July, pp. 778-779.

Malling, Birger. Local phototherapy in ocular diseases. *Acta Ophth.*, 1939, v. 17, pt. 2, p. 151.

A tabulation of results in twenty cases supports the author's contention that used with care this form of therapy is a valuable adjunct in the treatment of diseases of the anterior ocular segment.

Ray K. Daily.

Pfeiffer, R. L. Treatment of diseases of the eye with Grenz rays (border rays).* *Arch. of Ophth.*, 1939, v. 21, June, pp. 976-986.

These rays, which are not very penetrating and are absorbed in the superficial tissues, are electromagnetic oscillations of about 2 angstrom-units which produce characteristic clinical and biologic manifestations. The results of animal experimentation and of the treatment of 302 patients indicated that the rays exert an analgesic effect in most superficial diseases of the eye. They were easily administered and painless, the range of safety was great, and no serious effects were experienced. Most inflammatory conditions of the cornea were benefited, especially ulcers, and scleritis and episcleritis usually yielded to the treatment. Dystrophic conditions were not helped. These rays apparently are just as efficacious as and lack the disadvantages of other forms of radiant energy. (Bibliography, discussion.)

J. Hewitt Judd.

*Editorial note. As pointed out in *Amer. Jour. Ophth.* (1932, v. 15, p. 362), the German word "Grenz" means literally "boundary" or "border," and the custom of using the German word instead of the English one seems undesirable.

Puntenney, I., and Osborne, S. L. Temperature changes and changes in caliber of retinal blood vessels after short-wave diathermy. *Arch. of Ophth.*, 1939, v. 22, Aug., pp. 211-227.

The authors review the literature and present the results of their experiments in which they studied the heating of the conjunctiva, vitreous, and orbit; the histologic changes which occurred following the administration of heat; and the effect of heat upon the caliber of the retinal blood vessels. The average heating and cooling curves show that the body temperature bears a definite relation to the temperature of the ocular tissues during heating and cooling. These curves are of value in estimating the ocular temperature when only the rectal or abdominal temperature is known. It was found to be difficult to localize the heating energy to the eye. Microscopic studies were made to determine the pathologic changes which occur following the administration of short-wave diathermy. Fundus photographs show that the caliber of the retinal vessels in the anesthetized dog is not altered by short-wave diathermy.

J. Hewitt Judd.

Rolett, D. M. New anterior-chamber irrigator. *Arch. of Ophth.*, 1939, v. 22, Aug., pp. 289-290.

This consists of a rubber bulb capped with an attachment which fits any standard needle. The silver needle loop has three small perforations, one on each side and one at the top, which are so graded in size as to direct the jet of fluid emanating from them in a clockwise direction.

J. Hewitt Judd.

Sala, Guido. Ocular changes from stovarsol sodium. *Ann. di Ottal.*, 1939, v. 67, March, p. 208.

Stovarsol is a pentavalent arsenical

discovered by Fourné and derived from the substitution of two atoms of hydrogen in phenylarsenic acid; stovarsol titrates 27.2 percent arsenic. The author notes the absence of experimental research on stovarsol. He endeavored to determine its effect on the retina and optic nerve of experimental animals. He concludes that the atrophic conditions found in the retina and optic nerve after administration of stovarsol were the result of the disease for which it was given rather than an effect of the drug itself. (1 plate, 4 figures, bibliography.) Park Lewis.

Schmidt, R. Thermic conditions in healthy and diseased eyes of the rabbit after different therapeutic procedures. *Klin. M. f. Augenh.*, 1939, v. 102, June, p. 788.

Thermoelectric methods were employed in measuring variations in temperature of the eye after different forms of treatment. Heat (both dry and moist) and short-wave radiation changed the temperature of the healthy eye of the rabbit to a relatively high degree. After subconjunctival injections of a 5-percent sodium-chloride solution a slight increase of temperature in the cornea, anterior chamber, and vitreous occurred. Dionin salve (5 percent) and yellow ointment (2 and 5 percent) warmed only the marginal parts of the cornea. Massage with 2-percent dionin salve and subconjunctival injections of 2-percent sodium-chloride solution had no measurable effect on the internal temperature of the eye. The temperature of the inflamed eye was up to 2 degrees higher than that of the healthy eye. In slight inflammations dry heat and short waves produced a rise in temperature no greater than that produced in the healthy eye. With severe inflammations the thermal values increased

up to 1.2 degrees in the cornea and anterior chamber and to 0.6 degrees in the vitreous. After stopping the application of artificial heat, a more or less rapid decrease in ocular temperature occurred within a few minutes.

C. Zimmermann.

Szinegh, Bela. The use of p-amino-benzolsulphamid in ophthalmology. *Klin. M. f. Augenh.*, 1939, v. 102, May, p. 693.

Tests with this preparation, under the name of desepyl, in phlegmon of the lids, retrobulbar phlegmon, and infections after cataract operations were very successful. Its action is similar to that of prontosil. C. Zimmermann.

Venco, Luigi. Research on the chemico-therapeutic action of para-aminophenylsulphanilamide (prontosil) in experimental microbic infection of the eye. *Ann. di Ottal.*, 1939, v. 67, March, p. 179.

By means of streptococci introduced into the anterior chamber of the eyes of rabbits the author attempted to demonstrate the difference in the reaction of animals that had been administered sulphanilamide (red prontosil) by mouth as compared with others, as controls, that had not received this drug. In the controls, a severe suppurative process invariably developed in the anterior chamber even when the dilution of injected material was greater than 1 to 100,000. When larger amounts of the infective material were used the results were not always alike. In the animals given prontosil the results obtained depended primarily on the period at which the drug was given. If, while the progress of the infection was controlled, suppuration was far advanced, it gave place to an organized exudate in the anterior chamber.

If given early the effect depended upon the amount of infective material present and the dose administered. As a rule the greater the infection, the larger the amount of prontosil required.

In the author's experience 0.1 mg. of the drug was required for each kg. of weight of the animal to obtain protection. It is necessary to give the drug at an early stage of the infection and the dose at the beginning should be large enough to be adequate. The author reviews the principal hypotheses on the curative action of prontosil and concludes that the curative effect is dependent upon a number of factors in relation to the action of the drug on the germs and on the normal defensive mechanism of the organism. (Bibliography.)

Park Lewis.

Weekers, L. Treatment of ocular pain. *Bull. Soc. Belge d'Opht.*, 1938, no. 77, p. 72.

For ten years Weekers has been using, with good effect, orbital injections of alcohol for orbital pain. In addition to the relief of pain there is a favorable influence upon hypertension, photophobia, and blepharospasm. Perhaps these injections may exercise a favorable action upon the anatomic lesions themselves. They have been found useful in torpid corneal ulcers, painful scleritis, certain cases of iridocyclitis, and injuries of the globe. Alcohol is said to effect physiologic section of the nerves, but not always a complete one. In successful cases the favorable effect is obtained from the first injection. When the result is insufficient one may safely repeat the injection several times at intervals of eight days, but with minimal benefit. However, when the affection is of long standing or occurs in the form of a relapse one may successfully repeat the

injection after an interval of three or four weeks. The hypotonizing action of the orbital injection of alcohol is confirmed clinically. Though not as marked or constant as the anesthetic effect, it is far from negligible. In the most favorable cases of acute or subacute iridocyclitis the injection lowers the ocular tension to normal and occasionally produces a slight hypotension. In chronic hypertensive iridocyclitis the action is less effective. In violent phlyctenular blepharospasm the relief may be almost instantaneous.

Weekers has adopted as the habitual dose 1 to 1.5 cc. of 40-percent alcohol and long experience has failed to show any damage to vision from that dose. He devotes several pages to a consideration of recent contributions to the physiopathology and treatment of pain. He concludes that it is now well established that the phenomenon of pain is not psychologic but essentially physiologic, though the psychologic factor should not be neglected.

J. B. Thomas.

Weekers, L., Joiris, P., and Bonhomme, F. The mydriatic effects of adrenalin collyrium. *Bull. Soc. Belge d'Opht.*, 1938, no. 77, p. 101; and *Arch. d'Opht. etc.*, 1939, v. 3, Feb., p. 97.

After an extensive review of the use of adrenalin in ophthalmology, including the clinical indications, and the physiology and pharmacology of mydriasis, the authors conclude: (1) that one of the principal indications of adrenalin resides in its powerful mydriatic action; (2) that it is possible to obtain by means of adrenalin mydriatic effects corresponding to the requirements of the clinic and without recourse to subconjunctival injections; (3) that the optimum concentration for mydriatic effect is 2 percent; and (4)

that the solution should be as nearly as possible isotonic and iso-pH. (41 references.)

J. B. Thomas and Derrick Vail.

3

PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Allen, T. D. Compound prism chart. *Arch. of Ophth.*, 1939, v. 22, July, p. 113.

The chart is similar to those used by the manufacturing optician except that the reading is counterclockwise to conform to the trial frame.

J. Hewitt Judd.

Bari, Enzo di. Notes on the accommodation of the astigmatic eye. *Boll. d'Ocul.*, 1938, v. 17, Nov., pp. 919-928.

Assuming that accommodation is effected at the plane containing the circle of least confusion, the writer calculates the tolerance of the astigmatic eye at about 0.12 D., which does not require lens correction to give a distinct image of an object. This, however, varies with the size of the pupil and the diameter of the cones, and increases with contraction of the pupil (that is, the tolerance of a pupil of 2-mm. diameter is 0.25 D.). The writer notes also that study of the mechanism of vision needs to be continued from optical, physiologic, and psychologic standpoints.

M. Lombardo.

Bari, Enzo di. Variations permissible in the constants of spectacle lenses. *Boll. d'Ocul.*, 1938, v. 17, Oct., pp. 868-877.

On the basis of optico-anatomic characteristics of the eye and Helmholtz's theory of vision, the author determines the tolerance of the eye for variations from any lens power.

M. Lombardo.

Berg, Fredrik. Corneal and total astigmatism. *Acta Ophth.*, 1939, v. 17, pt. 2, p. 137.

Nordenson's method of measuring and computing the astigmatism of the posterior corneal surface is described in detail. The data thus obtained on 28 patients verify Tscherning's statement that the posterior corneal surface has an inverse astigmatism, but the difference between the horizontal and vertical meridians is less than that reported by Tscherning. The oblique incidence of the visual line in the horizontal meridian also causes a slight degree of inverse astigmatism, which increases with the square of the angle of incidence. A considerable degree of the total astigmatism is, however, to be attributed to the lens. Ray K. Daily.

Friedman, Benjamin. Demonstration bifocal lenses for trial case. *Arch. of Ophth.*, 1939, v. 22, Aug., p. 288.

These consist of flat, kryptok, bifocal lenses made up to fit in the standard trial-case rims. The distance portions are plano and the segments consist of additions of +0.75, +1.25, and +1.75 sph. The segment is placed so that when the handle is upright, the reading center is displaced nasally 1.5 mm.

J. Hewitt Judd.

Grunert, K. Dysfunction of the eyes and ovarian migraine. *Münch. med. Woch.*, 1939, v. 86, June 2, pp. 841-847.

Of a total of 312 patients with ovarian migraine the headaches were completely cured in 242 by correction of an ocular dysfunction, and in 58 by additional hormone therapy after marked improvement by the ocular therapy. In only 12 patients was the ocular therapy without effect.

Among the ocular conditions which had to be corrected, refractive errors

(269) prevailed. Thirteen young emmetropic patients had weakness of accommodation, and 12 were presbyopes. In a second group of patients muscular imbalance prevailed, in 6 cases without refractive error, in 76 combined with refractive errors. Only the small refractive errors come into consideration as etiologic factors. The effort to overcome them leads to nervous exhaustion, especially at a time when nervous strain is added, as during menstruation.

Accommodative insufficiency was treated with 0.2 to 1-percent solutions of pilocarpine, which was continued over a variable period of time until complete freedom from migraine was obtained. The average time of observation in these cases was $2\frac{1}{2}$ years, and freedom from attacks during this period was considered a cure.

Bertha A. Klien.

Haig, C., and Lewis, J. M. A simple method of measuring brightness threshold of dark-adapted eyes at all ages. *Proc. Soc. Exper. Biology and Med.*, 1939, v. 41, June, p. 415.

A description of a portable apparatus for measuring dark adaptation. Infants and young children are tested after dark adaptation by increasing the illumination to the point where the subject will visually follow movements of the test field.

George A. Filmer.

Jones, E. L. Inhibitions of the autonomic nervous system by eye stress. *Amer. Jour. Ophth.*, 1939, v. 22, Aug., pp. 887-890.

Karpe, G. The axial movement of the poles of the lens in accommodation. *Acta Ophth.*, 1939, v. 17, pt. 2, p. 172.

The objective of this investigator was to find out whether a recession of the reflex from the posterior lens cap-

sule during accommodation is caused by increased curvature of the posterior lens capsule or by a recession of the pole of the lens. A detailed description of the technique, computations, and findings are given. The data show that with 10 D. of accommodation, the increase in the curvature of the posterior lens capsule is constant for various test subjects. In the same state of accommodation the axial movement of the posterior lens capsule varies with individuals; in two test subjects there was no movement, in four a recession of 0.1 to 0.2 mm., and in two of 0.3 mm. The anterior lens capsule moved 0.4 mm. forward in two test subjects, in agreement with Gullstrand's schematic eye; in five the movement was less and in one greater. A table outlines the modification in Gullstrand's schematic eye indicated by the author's findings.

Ray K. Daily.

Koch, F. L. P., and Prangen, A. DeH. Marked anisometropia. *Arch. of Ophth.*, 1939, v. 21, June, pp. 987-989.

A patient aged 48 years accepted a correction of O.D. -19.25 cyl. ax. 90 degrees, and O.S. -3.50 sph. with +10.50 cyl. ax. 5 degrees. He wore the full correction with comfort and had second-degree fusion but not true stereopsis. The authors state that eventual full correction of anisometropia has been satisfactory in their experience.

J. Hewitt Judd.

Morgan, M. W., Jr., and Olmsted, J. M. D. Quantitative measurements of relative accommodation and relative convergence. *Proc. Soc. Exper. Biology and Med.*, 1939, v. 41, June, p. 303.

Using a haploscope with a fixation distance of 40 cm., it was found that the limits to which accommodation could be changed without a change in con-

vergence were 4.75 D. and 0.75 D. Convergence could not be changed without slightly changing accommodation.

George A. Filmer.

Pascal, J. I. Power of cylinders in oblique meridians. *Arch. of Ophth.*, 1939, v. 22, Aug., pp. 290-291.

The author points out that the tables giving the power of cylinder in any oblique meridian are only an approximation since the effective power of a cylinder is always at right angles to the axis.

J. Hewitt Judd.

Riddell, W. J. B. A comparison of lens and skiascope methods in retinoscopy with undilated pupils. *Brit. Jour. Ophth.*, 1939, v. 23, June, pp. 387-392.

A description of a useful skiascope which has proved itself to be a time-saving instrument in routine hospital use for some thirty years. Readings by this method are more myopic than by the trial case. Figures are based on 250 cases in which the trial frame and the skiascope have been compared. (Tables, references.)

D. F. Harbridge.

Rundles, W. Z. Streak retinoscopy. *Arch. of Ophth.*, 1939, v. 21, May, pp. 833-843.

The history of the invention and development of the streak retinoscope is reviewed, its use compared with that of the ordinary plane mirror, and a routine procedure outlined. The advantages of the method are: clarity of the fundus reflex, ability to measure accurately the refraction of different meridians individually, greater accuracy for the determination of the axis, and ability to perform retinoscopy with undilated pupils.

J. Hewitt Judd.

Schaefer, R. A caliper for measuring the distance between the vertex of the

contact glass and that of the spectacle lens. *Klin. M. f. Augenh.*, 1939, v. 102, June, p. 848.

The instrument is described and illustrated.

Sverdllick, José. Presentation of a lamp for afterimages and of a congruent apparatus of the type of Tschermak. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, Oct., p. 542.

This communication, which does not lend itself to abstraction, concerns itself with a discussion of new methods of investigation of normal and abnormal retinal correspondence.

Edward P. Burch.

Thorne, F. H., and Murphey, H. S. Cycloplegics. *Arch. of Ophth.*, 1939, v. 22, Aug., pp. 274-287.

The eyes observed for this investigation were divided into four series. Homatropine hydrobromide, benzedrine, and paredrine were administered in different combinations and strengths. Two drops of a 5-percent solution of homatropine hydrobromide in conjunction with benzedrine sulphate or paredrine hydrobromide, 6 drops of a 2-percent solution of homatropine hydrobromide, and 1, 2, and 3 drops of the same drug in 5-percent strength were found to depress accommodation with equal speed and to about the same degree. The period of greatest depression and the time until complete recovery were shorter when one drop of a 5-percent solution of homatropine hydrobromide was employed and instilled with great care. It was found that multiple instillations of homatropine, with or without benzedrine or paredrine, retarded the average recovery time without increasing the speed of onset or the depth of the cycloplegia. An ointment containing 2-

percent homatropine was found to be the least satisfactory method of administering homatropine cycloplegic. Since all or a part of one drop is easily flicked from the eye and little effect obtained, at least two drops should be instilled. Benzedrine and paredrine when administered alone are moderately effective mydriatics and reach their maximum action in 27 minutes. They exert only a slight cycloplegic action, the average depression of accommodation being 0.75 diopter.

J. Hewitt Judd.

Town, A. E. Contact glasses for correction of refractive errors in monocular aphakia; production of binocular single vision. *Arch. of Ophth.*, 1930, v. 21, June, pp. 1021-1026.

A brief history of the development and use of contact glasses is given. Three cases are reported illustrating that it is possible in cases of monocular aphakia to correct the disparity between the size and focus of the images in the two eyes sufficiently to produce normal or nearly normal vision, including fusion and binocular vision. (Discussion.)

J. Hewitt Judd.

Trendelenburg, Wilhelm. The best light quality for the anomaloscope and the question of transitional cases between the normal and protanomaly. *Klin. M. f. Augenh.*, 1939, v. 108, June, p. 769.

Since spectral distribution of luminosity varies with different sources of artificial light, respective readings on the anomaloscope correspondingly differ. Consequent disadvantages in practical and scientific evaluation of anomaloscopic investigations are eliminated by the quotient calculations previously recommended by the author (see *Amer. Jour. Ophth.*, 1930, v. 13,

p. 451), and by adjustment of the slit nearer to the center of the whole range. An abnormal quotient indicates numerically the deviation of an anomalous case from the normal. The quotient is entirely independent of the kind of light source.

C. Zimmermann.

4

OCULAR MOVEMENTS

Adroque, E., and Lagos, E. J. J. Case of lasting diplopia following operation for strabismus. *Arch. de Oft. de Buenos Aires*, 1938, v. 13, Oct., p. 512.

Case report of a 17-year-old girl who was operated upon for correction of a 40-degree left convergent squint. The left eye was amblyopic. Operation resulted in parallelism but was followed by crossed diplopia. Examination four years later showed 14 degrees of left external squint with persistent double vision which the authors attribute to abnormal persistence of the optico-spatial scheme which was present before operation. Edward P. Burch.

Bielschowsky, A. Lectures on motor anomalies. 11. Etiology, prognosis, and treatment of ocular paralyses. *Amer. Jour. Ophth.*, 1939, v. 22, July, pp. 723-734.

Bielschowsky, A. Lectures on motor anomalies. 12. Ocular spasms. *Amer. Jour. Ophth.*, 1939, v. 22, Aug., pp. 856-860.

Borsotti, I. The diagnosis of paralysis and contraction of the vertical motor muscles of the eye. *Ann. di Ottal.*, 1939, v. 67, April, p. 241.

The diagnosis of paralysis of the vertical motor muscles of the eye, so often complicated by contraction of the antagonist muscle, presents difficulties for both the ophthalmologist and the

neurologist. This form may occasion numerous and serious disturbances not the least of which is torticollis, and the relief from its correction may be rapid and brilliant. To Bielschowsky we are indebted not only for the conventional terms now universally accepted of positive and negative vertical divergence, but also for giving us exact methods of diagnosis with demonstrated cases. The only objection that can be raised in this connection is the complexity of the reasoning by which the individual diagnosis must be made.

The author presents a method of greater simplification and exactitude based on the static rather than on the dynamic functions of the vertical muscles. Convinced of the value of the method proposed, he discusses the subject under the following heads: (1) functions of the vertical motor muscles, (2) critical diagnostic points derived from loss of these functions, and (3) selection and coördination of the diagnostic criteria with Franceschetti's table. The technique for examination of vertical diplopia and the appliances necessary to make the tests are considered. The value of the method as described is that it is not abstruse or complicated, but is exceedingly practical and may be carried out quickly and easily. (Bibliography.)

Park Lewis.

Chavasse, F. B. The ocular palsies. Some clinical sequels of ocular palsy. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 2, p. 483.

The author demonstrates with illustrations the sequels of overaction, contracture, and secondary palsy from disuse, the relation between primary and secondary deviations and between them and past pointing, the development of comitance, and the functional

palsy of the contralateral antagonist. By contrast, in congenital palsy there is no amblyopia, no diplopia, no past pointing, and no excess of secondary deviation over primary.

Beulah Cushman.

Gifford, S. R. Paradoxic elevation of the lid. *Arch. of Ophth.*, 1939, v. 22, Aug., pp. 252-256. (See Section 14, Eyelids and lacrimal apparatus.)

Helfand, Max. Congenital familial external ophthalmoplegia without ptosis; with a lesion of the pyramidal tract. *Arch. of Ophth.*, 1939, v. 21, May, pp. 823-827.

The case of a 22-year-old woman in whom the syndrome occurred is presented, and the various theories to account for the anomalies are reviewed. This syndrome would be produced if, during the fourth or fifth week of embryonic life, an abnormal bleb situated at the cephalic flexure should injure the anlage of the motor tract and spare the sensory anlage which is already ripened and therefore more resistant to pressure.

J. Hewitt Judd.

Morax, P. V. Paralyzes of associated movements of the eyes. *Ann. d'Ocul.*, 1939, v. 76, May, pp. 337-376.

Methodical examination of conjugate deviations of the eyes serves to separate voluntary and reflex movements. Paralyzes may involve only voluntary actions with preservation of reflex movements, or may be complete. The former may be due to lesions of the psychomotor centers for gaze in the prerolandic area or in the motor tracts passing from them through the pyramidal pathways to the oculomotor nuclei. Central lesions seem to be associated with paralyzes of voluntary lateral gaze, tract lesions with voluntary vertical paralyzes.

Complete paralyses, including loss of reflex movements, are found with lesions in the immediate vicinity of the oculomotor nuclei, in the posterior white commissure, or in the posterior longitudinal bundle. Complete paralyses of elevation, depression, or both, with or without loss of convergence (Parinaud's syndrome) are due to a mesencephalic lesion destroying the white posterior commissure near the quadrigeminal plate. Almost constant involvement of the neighboring pupilomotor centers explains the commonly associated disturbances in the light reflex. Complete paralysis of gaze to right or left is brought about by lesions destroying the posterior longitudinal bundle in the vicinity of the sixth nucleus.

John M. McLean.

Sala, Guido. A case of paralysis of upward movement of eyeballs together with rare associated symptoms. *Boll. d'Ocul.*, 1938, v. 17, Oct., pp. 841-854.

A woman of 35 years showing marked cardiovascular involvement with hypertension, after reaching the eighth month of gestation became suddenly affected by the following symptomatology: retraction of both upper lids, downward deviation of both eyeballs, paralysis of upward movements, anisocoria, sluggish pupillary reactions, small retinal hemorrhages on the left, and left hemiparesis. All these symptoms gradually disappeared after interruption of pregnancy. The writer is of the opinion that the condition had a vascular origin, namely a cerebral hemorrhage. (Bibliography.)

M. Lombardo.

Smith, M. I. Significance of false projection in treatment of squint. *Arch. of Ophth.*, 1939, v. 21, June, pp. 990-998.

This report is based on a study of 600 consecutive cases of strabismus from

the orthoptic clinic of the Wilmer Ophthalmological Institute. It was found that false projection occurred in approximately half of the patients with convergent squint and most often in squint developing before the age of two years. False projection occurred at any angle of deviation and was not influenced by amblyopia. Normal projection can be restored in the majority of cases, and is necessary for binocular vision.

J. Hewitt Judd.

Smukler, M. E. A flexible needle for the O'Connor cinch operation. *Arch. of Ophth.*, 1939, v. 22, July, p. 112.

The needle is made by replacing the short, rigid tip of the Hosford-Hicks needle with a wire tip which is gradually tapered to a blunt end. The flexible tip is 3 cm. long and is made of 14-gauge wire.

J. Hewitt Judd.

Sobanski, Janusz. A lamp for the examination of disturbances in ocular motility. *Klinika Oczna*, 1939, v. 17, pt. 2, p. 217.

The lamp consists of a globe encased in a round metal cylinder, with a 14-cm., vertical slit. (Illustrations.)

Ray K. Daily.

Weekers, L. Advancement or recession in the treatment of strabismus? A procedure of recession. *Ophthalmologica*, 1939, v. 97, May, p. 81.

The effect of advancement depends essentially on shortening of the muscle; hence, it is advisable to strive for shortening from the start. It is necessary to make this shortening sufficient to avoid the disastrous effects of tenotomy, and to use a technique that guards against loosening of the muscle after operation. The author describes his own method, which consists of resection of a portion of the muscle and

suturing the end of the proximal portion to the old insertion of the muscle.

F. Herbert Haessler.

White, J. W., and Brown, H. W. Occurrence of vertical anomalies associated with convergent and divergent anomalies; a clinical study. *Arch. of Ophth.*, 1939, v. 21, June, pp. 999-1009; also *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1938, 43rd mtg., p. 329.

In a study of 11,600 persons it was found that 1,955 showed some anomaly of the motor muscles and 715 had a vertical anomaly. These are analyzed in groups having various combinations of lateral and vertical anomalies. Seven cases are reported in detail to illustrate that the vertical imbalance seems to be definitely responsible for the unsatisfactory results from treatment by glasses, orthoptic training, or operation, and is an active factor in producing convergent and divergent strabismus. The changes in operative correction of lateral squint which a vertical deviation necessitates are discussed. In most cases the vertical imbalance should be corrected before the lateral imbalance. However, in those cases in which the lateral imbalance is marked it may not be possible to study the vertical imbalance properly until after the lateral deviation has been corrected. (Discussion.)

J. Hewitt Judd.

Yaskin, J. C. Paralysis of the extraocular muscles; clinico-anatomic considerations; report of cases of paralysis of the oculomotor and abducens nerves due to unusual causes. *Arch. of Ophth.*, 1939, v. 21, June, pp. 1010-1020.

A clinico-anatomic review of the orbital nerves, stressing the relation of the paranasal sinuses to the nerves supplying the extraocular muscles is given. The role of Dorello's canal as a cause

of paralysis of the abducens nerve in infections in the region of the petrous apex or the sphenoid sinus, in increased intracranial pressure, and in injuries and vascular lesions at the base of the skull is considered. The causes of paralyzes of the various extraocular muscles are reviewed and two cases with pain referable to the trigeminus nerve and an associated sinus infection are reported. Nine cases of isolated unilateral paralysis of the abducens nerve of obscure origin terminated in recovery. Causes of bilateral paralysis of the abducens nerve with two cases of this condition are also considered.

J. Hewitt Judd.

5

CONJUNCTIVA

Agnello, F. Angioneurotic edema and allergic conjunctivitis. *Boll. d'Ocul.*, 1938, v. 17, Oct., pp. 878-884. (See Section 14, Eyelids and lacrimal apparatus.)

Appelmans. Infectious conjunctivitis of Parinaud caused by the virus of the disease of Nicolas and Favre. *Bull. Soc. Belge d'Opht.*, 1938, no. 77, p. 130. (See *Amer. Jour. Ophth.*, 1939, v. 22, Aug., p. 936.)

Bates, R. M. A case of cutaneous and conjunctival diphtheria. *Brit. Jour. Dermatology and Syphilis*, 1939, v. 51, Feb., pp. 76-79.

A case of cutaneous diphtheria of the face with secondary involvement of the bulbar conjunctiva is reported. There was complete recovery of both lesions after treatment with antitoxin.

T. E. Sanders.

Bello, Domenico. Experimental researches on natural histogenic immunity of the rabbit conjunctiva against pneumococcus, gonococcus, and diph-

theria bacillus. *Boll. d'Ocul.*, 1938, v. 17, Oct., pp. 816-840.

These experiments were made by increasing the virulence of the pneumococcus before using it, by obtaining the gonococcus from patients affected by blennorrhagic conjunctivitis, or after decreasing the defense power of the rabbit conjunctiva by physical or chemical means. The slight local irritative reaction after instillation of pneumococci, or the more intense reaction after instillation of a solution of silver nitrate followed by instillation of gonococci, is due to mechanical closure of the lids or the chemical action of silver nitrate. This is shown by negative bacteriologic findings in the conjunctival secretion. The natural immunity of the conjunctiva of the rabbit finds its foundation in the histologic structure of its epithelium and the numerous lymphatic nodules underlying the stratified epithelium. The different action of bacteria in the human conjunctiva is due to the absence of lymph follicles and to the presence of cylindric epithelium which is highly susceptible to the action of germs. (Bibliography.)

M. Lombardo.

Blaess, M. J. **Circumcorneal telangiectasis.** *Arch. of Ophth.*, 1939, v. 21, June, pp. 1031-1033.

This condition associated with nevus flammeus of the skin of the temple, lids, and bridge of the nose on the same side occurred in one eye of a man aged 54 years. Choroidal vessels were not involved. A detailed description is given and the condition illustrated by a photograph. Cataract extraction was performed without complication.

J. Hewitt Judd.

Blondel, G., and Bonhomme, F. **Chronic pemphigus with ocular man-**

ifestations. *Bull. Soc. Belge d'Opht.*, 1938, no. 77, p. 143.

This affection is characterized by the sudden appearance of bullae of the conjunctiva which rupture so promptly that they often escape the attention of the clinician. Following their rupture cicatricial adhesions develop which are of great importance. The author reports a case in which the patient when first examined by an oculist had already developed in both eyes cicatricial entropion, deformity of the tarsus, trichiasis, and symblepharon. At this stage one must make a differential diagnosis between trachoma, xerosis, pemphigus, and ocular diphtheria. In true chronic pemphigus we have the history of affections of the skin and mucous membranes. Treatment seems to offer but little hope for more than temporary relief. (References, illustration.)

J. B. Thomas.

Bonnet, P., Bonamour, G., and El Khalifah, M. **Ocular chrysiasis (impregnation of the cornea and conjunctiva by gold).** *Arch. d'Opht. etc.*, 1939, v. 3, May, p. 385. (See Section 6, Cornea and sclera.)

Borsello, Giuseppe. **Circumscribed hyperplasia of the palpebral conjunctiva with histologic findings similar to trachoma.** *Rassegna Ital. d'Ottal.*, 1939, v. 8, Jan.-Feb., p. 84.

The writer excised a large mass of hyperplastic tissue from the upper temporal quadrant of the left palpebral conjunctiva. The mass was papillomatous. The microscopic picture is described in detail and resembled greatly trachomatous tissue. After a full diagnostic discussion the author comes to the conclusion that the tissue is a form of trachomatous vegetation, arising primarily, and localized to a re-

stricted zone of conjunctiva. From the description of the eye, one would judge that the patient had an otherwise typical trachoma. (10 figures.)

Eugene M. Blake.

Braley, A. E. The rickettsia question in trachoma. 1. Microscopic observations on the virus. *Arch. of Ophth.*, 1939, v. 21, May, pp. 735-740.

A comparative study of smear preparations fixed in absolute methyl alcohol and stained by the Giemsa method was made of the epithelial cells from normal, nontrachomatous, and trachomatous conjunctivas. Mitochondria and keratin granules of normal living conjunctival epithelial cells as seen in the dark field can be stained by the Giemsa method. The inclusion bodies of trachoma and of psittacosis are similar under dark-field illumination. The bodies described and photographed by Busacca, Cuénod and Nataf, and others undoubtedly represent stained mitochondria and keratin granules rather than rickettsias. J. Hewitt Judd.

Braley, A. E. The rickettsia question in trachoma. 2. The louse as a possible disseminating agent for the virus. *Arch. of Ophth.*, 1939, v. 22, Aug., pp. 262-270.

The present studies were undertaken in an attempt to identify and cultivate the normal rickettsia flora of the gastrointestinal tract of the louse, to compare the morphologic structure of the Halberstaedter-Prowazek bodies of trachoma with those of the cellular inclusions of the louse, to reproduce trachoma in baboons with lice obtained from patients with trachoma, and to infect the gastrointestinal tract of the louse with trachomatous material and then test the infectivity of such lice on the conjunctivas of baboons. It was

found that less than 1 percent of lice removed from Indian patients with trachoma show rickettsias in the gastrointestinal tract. The rickettsias in a few lice, because of staining reaction and morphologic structure, appeared to be rickettsias of the louse (*Rickettsia pediculi*), but morphologically no bodies found in the louse even vaguely suggested the Halberstaedter-Prowazek bodies. Ground lice from Indian patients with trachoma did not transmit conjunctival disease to baboons. No rickettsias grew on the chorioallantoic membrane of the developing chick embryo. The trachoma virus in the gastrointestinal tract of the louse disappeared within 48 hours. Ground lice infected with trachomatous material did not produce conjunctivitis in baboons.

J. Hewitt Judd.

Cuesta Yañez, T. S. B. Treatment of trachoma and its complications with sulpharsenol. *La Semana Méd.*, 1939, April 13, p. 840.

Five cases are reported successfully treated with this drug.

George A. Filmer.

Dulewiczowa, M., and Okolow-Hryniewiczowa, G. Trachoma of the semilunar folds and caruncle. *Klinika Oczna*, 1939, v. 17, pt. 2, p. 249.

Forty-nine patients with 93 eyes in the various stages of trachoma were examined with the slitlamp and corneal microscope under a 22 magnification. This study reveals that the caruncle and semilunar folds are involved in all the phases of trachoma; frequently the caruncle and semilunar folds show pathologic processes which have been concluded in the palpebral conjunctiva. The processes seen were lymphocytic infiltration, follicles, cicatrization, and xerosis. Papillary hypertrophy does not

occur because of the histologic structure of these tissues. The temporal side of the caruncle, which approaches in structure the bulbar conjunctiva, is the seat of follicles, infiltrations, and cicatrices. Most frequently granulations on the plica semilunaris are found on its superior temporal portion. Small round follicles are not characteristic of trachoma and are found also in follicular conjunctivitis, but large follicles as well as follicular conglomerations are seen only in trachoma. These findings point to the importance of including the caruncle and plica in therapeutic or mechanotherapeutic procedures; otherwise these structures may remain as sources of contagion in apparently cured cases.

Ray K. Daily.

Foley, H., and Parrot, L. Regarding the rickettsia of trachoma. *Arch. d'Ophth. etc.*, 1939, v. 3, March, p. 230.

Foley and Parrot hasten to correct Poleff (see *Amer. Jour. Ophth.*, 1938, v. 21, p. 1193), who stated that Busacca and Cuénod had demonstrated the identity of intrafollicular rickettsia with the Prowazek corpuscles. On the contrary, say Foley and Parrot, Busacca said they did not resemble each other. Foley and Parrot repeat their conclusions, the most important of which is that the true rickettsia of trachoma corresponds exactly with the inclusions of Halberstaedter and Prowazek.

Derrick Vail.

Hurst, V. R. Oculoglandular diseases with special reference to tularemia and Parinaud's conjunctivitis. *Amer. Jour. Ophth.*, 1939, v. 22, Aug., pp. 891-897; also *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1938, 43rd mtg., p. 363.

Julianelle, L. A. Effect of trypsin on the virus of trachoma. *Proc. Soc. Exper. Biol. and Med.*, 1939, v. 40, pp. 222-223.

Separation of the virus of trachoma from the mixture of material obtained from conjunctival scrapings was attempted by digestion with trypsin. It is concluded that tryptic digestion causes inactivation of the virus, as none of the digest material was infective for monkeys.

T. E. Sanders.

McKee, S. H. Gonorrheal ophthalmia cured after one week's treatment with sulphanilamide. *Arch. of Ophth.*, 1939, v. 21, June, pp. 1035-1036.

A man aged 23 years presented the typical appearance of severe gonorrheal ophthalmia. In addition to the usual local treatment, 15 grains of sulphanilamide with 5 grains of sodium bicarbonate every six hours were administered internally. By the third day the discharge was noticeably less, on the fifth day it had almost disappeared, and prolonged search for gonococci in an epithelial-cell smear gave negative results.

J. Hewitt Judd.

McKenzie, W. H. Tuberculosis of the conjunctiva. *Amer. Jour. Ophth.*, 1939, v. 22, July, pp. 744-749.

Madroszkiewicz, M., and Przbylkiewicz, Z. Intraocular and intracranial inoculations of trachomatous material in animals. *Klinika Oczna*, 1939, v. 17, pt. 2, p. 265.

The trachomatous material was obtained from seven patients with frank trachoma. In six the Halberstaedter-Prowazek bodies were demonstrated, and a culture from four cases grew gram-negative bacilli as yet undescribed. The intracranial inoculations produced perivascular infiltrations but no follicles. The inoculations into the vitreous of rabbits produced in one case a conjunctival folliculosis resembling trachoma, but follicles in the vitreous could not be demonstrated.

Ray K. Daily.

Manditch. The diagnostic value of the Weil-Félix reaction in trachoma. *Rev. Internat. du Trachome*, 1939, v. 16, April, p. 92.

Numerous blood tests were carried out on 50 trachomatous and 50 nontrachomatous subjects. Among trachomatous individuals the reaction was positive in 23 of the 50 cases, and among nontrachomatous individuals, in 15 of the 50 cases. The author's opinion is that the Weil-Félix reaction has no significant diagnostic value in trachoma.

J. Wesley McKinney.

Michels, M. W. Sulphanilamide in the treatment of gonorrheal ophthalmia in children. *Jour. of Pediatrics*, 1938, v. 13, Oct., pp. 527-541.

Fifteen patients with gonorrheal ophthalmia, at ages varying from five days to three years, were treated with sulphanilamide, one grain per pound per day. This series had an average hospitalization of 5.8 days, while a control series of 32 cases showed an average hospitalization of 28.5 days. In the cases thus treated there was a rapid decrease in swelling and discharge, with less corneal involvement. No toxic symptoms were noted in any case.

T. E. Sanders.

Moretti, Egisto. Treatment of trachoma by loosening the conjunctiva. *Rassegna Ital. d'Ottal.*, 1939, v. 8, Jan.-Feb., p. 47.

Together with crushing of the follicles in trachoma by roller forceps and gentle curettage of the granules, Moretti recommends a procedure which he calls loosening of the conjunctiva. This is done by making an incision in the conjunctiva just above the outer edge of the upper tarsus, introducing a spatula, and gently freeing the adenoid and subepithelial layer from the deeper

strata. The procedure is carried out over the entire extent of the conjunctiva, both palpebral and bulbar. An ointment of 3-percent tannic acid is placed in the conjunctival sac and the eye bandaged. Very satisfactory results are claimed for this minor surgical operation. (6 figures.)

Eugene M. Blake.

Poleff, L. Passage of "rickettsioid corpuscles" of trachoma on the tissue of the human eye outside the organism and general observations on the culture of these formations in vitro. *Rev. Internat. du Trachome*, 1939, v. 16, April, p. 79.

In order to help clear up the question of the etiologic significance of rickettsioid bodies in trachoma, a method of culture in vitro by explantation of tissue was devised. Human placenta and cornea were found to make good culture media.

J. Wesley McKinney.

Radlo, P., and Rostkowski, L. Serologic studies in trachoma. *Klinika Oczna*, 1939, v. 17, pt. 2, p. 281.

A total of 525 persons, of whom 350 had trachoma, were given the Weigl and Weil-Félix tests. The results were negative relative to the significance of typhus rickettsia in trachoma; there was no appreciable difference in the response of the trachomatous and normal individuals.

Ray K. Daily.

Rötth, András. Replacement of conjunctiva by fetal membrane. *Orvosi Hetilap*, 1939, v. 83, June, p. 539.

Fetal membrane is a suitable membrane for substituting conjunctiva when this tissue becomes defective from a destructive disease or trauma. It is to be preferred to mucous membrane, especially when bulbar con-

junctiva has to be substituted. Amnion being an embryonic tissue has the ability of adaptation and heals with a lustrous surface. R. Grunfeld.

Schousboë, F., Some manifestations observed in North Africa of hereditary and acquired syphilis in the region of the limbus. *Ann. d'Ocul.*, 1939, v. 76, May, pp. 376-390.

Lesions in or near the limbus are frequently seen in North Africa. They are all associated with syphilis, either acquired or congenital. The author discusses them as (1) segmentary and nodular interstitial keratitis, (2) nodular scleroconjunctivitis, and (3) nodular sclerokeratitis. Such lesions are frequently (63 percent) found in children from five to ten years old. Among children, girls are more frequently affected (70 percent), but in adults there is no sex distinction. In children the lesions are usually monocular, in adults binocular. Trachoma is often found as an associated condition, and so is tuberculosis. All cases improve promptly on antisypilitic iodide-mercury therapy. (Tabulation of details in a series of 30 cases.) John M. McLean.

Senger, W. Further reports of an epidemic conjunctivitis of unknown etiology. *Münch. med. Woch.*, 1939, v. 86, April 21, p. 607. (See Section 6, Cornea and sclera.)

Slobozianu, H., and Herscovici, P. Treatment of gonococcal conjunctivitis of the newborn by the organic derivatives of sulphur. *Ann. d'Ocul.*, 1939, v. 176, June, pp. 466-470.

Seventeen cases of gonococcal conjunctivitis in the newborn were treated with sulphanilamide compounds. The first six were treated with uliron in a dosage varying from 0.5 to 0.75 gm. a day for the first few days and then

0.25 gm. a day. Chemotherapy was combined with local irrigation every four hours. Two out of six cases were resistant to the therapy and were not cured until sixteen and eighteen days later respectively. The other four responded more promptly and were well in about a week with the disappearance of the gonococcus from the fourth to the eighth day. A second series was treated with rodilone. Two of these were somewhat resistant to chemotherapy and routine local treatment had to be resorted to. The other three were cured within seven to ten days. Dosage of rodilone was the same as that of uliron. A third series of six cases was given the classical local treatment plus dagenan (sulphapyridine). Infants of normal weight received 0.5 gm. a day and prematures 0.25 gm. a day, divided into six doses. In all these cases secretion diminished on the third or fourth day and disappeared on the fourth or fifth. Bacteriologic cure was obtained within three to six days. None of these cases was resistant to chemotherapy. Tolerance in the newborn to these organic sulphanilamide derivatives was very good. None of the 17 infants treated showed vomiting, diarrhea, or loss of weight; a few had a light cyanosis which disappeared when sodium bicarbonate and vitamin C were given. Apparently combination of classical external treatment and oral administration of sulphanilamide compounds gives best and most rapid results. Comparison of results with the three drugs used suggests that dagenan is somewhat more effective. The authors conclude that if a marked improvement is not noted after five days of proper internal treatment, then classical local therapy should be used. If after ten days of treatment the conjunctivitis is not cured, they advise stopping chemo-

therapy in order to avoid possible toxic reaction. John M. McLean.

Smitmans, F. K. Keratoconjunctivitis epidemica 1938. *Med. Klin.*, 1939, v. 35, Feb. 24, pp. 234-237. (See Section 6, Cornea and Sclera.)

Sorsby, A., Hamburger, R., Coveney, M. F., and Nevin, M. E. The etiology and treatment of phlyctenular ophthalmia. *Trans. Ophth. Soc. United Kingdom*, 1938, v. 58, pt. 1, p. 173.

A previous survey of patients admitted with a diagnosis of phlyctenular disease (see *Amer. Jour. Ophth.*, 1937, v. 20, p. 663) compared the results of positive tuberculin reactions in them with those obtained in the group admitted for blepharitis.

The phlyctenular group were 75.4 and 50 percent positive in two different age groups, as against 19.7 and 9.4 percent respectively in blepharitis. Radiological evidence of pulmonary tuberculosis was found in 70.7 percent in the phlyctenular group as against 16.1 percent in the control group. Three cases of clinical tuberculosis developed in the phlyctenular group and none in the blepharitis group. Twenty-two cases of definite tuberculosis were seen in the 239 phlyctenular cases and none in the 429 cases of blepharitis. Clinical tuberculosis was found distributed to the hip joint (2 cases), spine (1), cervical glands (3), and chest (16), including 1 with chest and elbow. The sedimentation rate was found to be elevated in 82 percent of the active phlyctenular cases and in 14 percent of the active blepharitis cases.

Treatment for phlyctenular disease consisted of attention to fresh air and diet. Atropine and dark glasses were usually the only local remedies used. The Mantoux or intradermal test was

found to be a more sensitive tuberculin test than the Moro dermatuberculin test. Beulah Cushman.

Stewart, F. H. The etiology of trachoma. *Brit. Jour. Ophth.*, 1939, v. 23, June, pp. 373-380.

The author discusses the etiology of trachoma under the divisions of allied parasites, filterability, virulence of trachoma, animals susceptible to trachoma, and carriage by insects. The parasitic cause of trachoma was established in 1907 as a virus, the most conspicuous form of which is the Prowazek-Halberstaedter inclusion body. It is further remarked that while inclusion bodies are abundant in some instances, they are scarce and difficult to locate in others. Experiments on filtration of the virus have resulted in contradictory findings, and carriage by flies, lice, and other insects has not been fully substantiated. Infection is usually by direct contact, although mechanical carriage by cloth or flies for a short time is possible. (Figures, references.)

D. F. Harbridge.

Szinegh, Béla. Electyl in the treatment of blennorrhoea. *Orvosi Hetilap*, 1939, v. 83, Feb., p. 201; also *Klin. M. f. Augenh.*, 1939, v. 102, June, p. 800.

Quick and smooth healing was obtained in blennorrhoea following the oral administration of electyl, a benzol-sulpho-dimethyl-amido preparation. The customary milk injections, however, must not be abandoned. The drug acts through the medium of the reticuloendothelial system. In case this system is exhausted, as in lues, the drug is not effective. R. Grunfeld.

Taborisky, J. Problems of trachoma and the methods of their solution. *Rev. Internat. du Trachome*, 1939, v. 16, April, p. 65.

The author considers the diagnosis and the initial stage of trachoma and discusses the differentiation between trachoma and follicular conjunctivitis.

J. Wesley McKinney.

Trantas, A. An operative treatment of vernal catarrh called by J. Shimkin "antepositio conjunctivae fornicis." *Klin. M. f. Augenh.*, 1939, v. 102, June, p. 850.

Of 1,150 cases of vernal catarrh in Constantinople and Athens, six were found to have lost the vision of one or both eyes, showing that this condition does not always have a benign course. In cases of unusually long duration with severe changes, it may be of benefit to excise the tarsal conjunctiva and pull down the conjunctiva of the fornix, suturing it to the lowest part of the exposed tarsus. C. Zimmermann.

Urbanek, J., and Roschkott, A. Influence of seasons and weather on the frequency curve of scrofulous keratoconjunctivitis. *Klin. M. f. Augenh.*, 1939, v. 102, May, p. 668. (See Section 6, Cornea and sclera.)

6

CORNEA AND SCLERA

Arruga, H. The corneal graft. *Arch. d'Ophth. etc.*, 1939, v. 3, April, p. 289.

The history of this operation is briefly discussed. The indications have increased in the last few years, thanks to better instrumentation and better understanding of important factors. In reviewing the entire subject, the author includes his own experience of 26 cases, and is able to draw certain conclusions of importance. The most favorable cases are those following interstitial keratitis, scrofula, trauma, circumscribed ulcer, thermic or chemical superficial burns. A central leucoma

surrounded by healthy cornea is almost always successfully operated upon (80 percent). The chances of success therefore vary with the extent of corneal opacification. The initial cause of the leucoma has no bearing on its operability. Recently keratoplasty has been successfully used in cases of hereditary corneal dystrophy and in advanced keratoconus. Unfavorable cases are those of total leucoma, abnormal ocular tensions (hypo and hyper), and deep vascularization of the corneal stroma. Superficial vascularization can be dissected off prior to keratoplasty. The glaucomatous eye should be operated upon (the author prefers the Lagrange sclerectomy) before the grafting operation is attempted. Aphakia does not constitute a contraindication.

Cadaver material is extensively used. The age of the deceased has no bearing on the success. The condition of the donor tissue is not so important as the condition of the recipient's cornea. The graft should be subjected to temperature below freezing to desensitize the tissue. The author wraps the graft in gauze soaked with sterile water and places it in an ice box. Good results have been obtained with material so treated, even at the end of two days. The instrumentation (the author prefers the Grieshaber trephine), preparation of the patient, and technique of the operation (especially keeping the graft in place by sutures, conjunctival flap, or both) are described. Keratoplasty can be repeated if necessary. The complications are as follows: (1) Failure of the graft to adhere (seldom seen following the modern technique). (2) Ocular hypertension (very common, and can be treated by paracentesis, miotics, or, if necessary, a fistulization operation). Hypertension compromises the transparency of the graft, and leads

to complicated astigmatism. Contact glasses may be used to aid in keeping the graft from swelling. (3) Opacification of the graft (the most frequent complication). This may appear after the first few weeks have elapsed, and sometimes after the first month. It is rare that the transparency of the cornea changes after five or six months. Dionin, vitamin A, picric-acid salve, subconjunctival injections of sodium chloride, paracentesis, foreign-protein injections, and the administration of vitamins and tonics are utilized in combating opacification. The statistics of results obtained by various authors show 15 to 20 percent success with transparency, 35 to 40 percent semi-transparency, and 40 to 50 percent opacification. In successful cases the vision varied between 0.2 and 0.5. (Illustrations, bibliography.)

Derrick Vail.

Badot, J. Traumatic keratitis. Bull. Soc. Belge d'Opht., 1938, no. 77, p. 169.

The author reports two cases of traumatic keratitis, one of which after a few days developed progressive infiltration of the corneal parenchyma. A Wassermann blood test was strongly positive and specific treatment was successful. Simple traumatic interstitial keratitis, uninfluenced by some existing diathesis, must be rare. To establish a diagnosis of syphilitic traumatic parenchymatous keratitis one must be certain of injury, followed after a delay of five or six days by corneal infiltration, and accompanied by a positive Wassermann reaction. In discussing this report, Jeandelize stated that it was his custom, before operating on the cornea, to give antisymphilitic treatment to patients known to be syphilitic. This whole problem is fraught with medico-legal possibilities. (8 references.)

J. B. Thomas.

Castroviejo, Ramon. Present status of keratoplasty. Arch. of Ophth., 1939, v. 22, July, pp. 114-126.

The author discusses the sources of donor material, types of keratoplasty, and techniques employed by the surgeons who have pioneered in this type of work, and whose methods are most widely used at present (Elschnig, Filatov, Thomas, and Castroviejo). (Drawings, photographs, bibliography.)

J. Hewitt Judd.

Bailey, J. H., and Saskin, E. Treatment of severe corneal ulcer with sulphanilamide. Arch. of Ophth., 1939, v. 22, July, pp. 89-96.

In nine cases of severe involvement of the eye, sulphanilamide was administered with strikingly favorable results. Six of these cases were of severe corneal ulcer, the ulcer in most instances being due to chemical burns and trauma. The subjective improvement was rapid and spectacular, and the final visual acuity extremely good. While the lesions healed slowly, progress was more satisfactory than with the usual measures employed for these conditions. Medication was exclusively by mouth. All of the patients exhibited side effects which, however, did not interfere appreciably with the pursuit of the treatment.

J. Hewitt Judd.

Berliner, M. L. Lipin keratitis of Hurler's syndrome (gargoylism or dysostosis multiplex). Arch. of Ophth., 1939, 22, July, pp. 97-105.

Slitlamp examination of the corneas of three patients revealed a typical form of infiltration. With oblique illumination it was seen as a diffuse cloudiness, but in optical section the opacity was seen to be composed of a fine, yellowish-white granular deposit in the deeper corneal layers. Histologic examination

of one eye, obtained at autopsy, showed the deposit to be lipin lying in the spindle-shaped interlamellar spaces. (Photographs, photomicrographs.)

J. Hewitt Judd.

Brav, Aaron. Neoprontosil in the treatment of recurrent trachomatous ulcerations of the cornea. *Amer. Jour. Ophth.*, 1939, v. 22, Aug., pp. 901-902.

Friede, Reinhard. Keratoplasty followed by lens extraction in juvenile corneal maculae and excessive myopia. *Klin. M. f. Augenh.*, 1939, v. 102, May, p. 687.

A man of 45 years with postscrofulous corneal scars failed to get better vision with correction. Improvement of vision was obtained by keratoplasty with subsequent extraction of the lens. Friede had better results with transplants of cadaver cornea than with those from enucleated eyes. Experience has shown that clear healing is dependent on the quality of the flap.

C. Zimmermann.

Givner, Isadore. Episcleral ganglion cells. *Arch. of Ophth.*, 1939, v. 22, July, pp. 82-88.

An accessory ciliary ganglion of Axenfeld found in a case of hypertensive neuroretinitis is described and is illustrated by photomicrographs. Since, in a study of ten consecutive eyes, ganglion cells were found in every eye, situated usually with a ciliary nerve either sclerally, episclerally, or a short distance removed from the globe, it is thought that they are probably present in every eye. By looking for these in each instance and classifying the changes as to type and the pathologic condition with which they are associated, a better understanding of their true function might be obtained.

J. Hewitt Judd.

Kirwan, E. O'G. Transplantation of the cornea. *Arch. of Ophth.*, 1939, v. 22, July, pp. 21-24.

A transplantation was done on the eye of a Hindu woman aged 26 years, which presented an extensive opacity from interstitial keratitis. The diameter of the graft was 4.5 mm. and that of the trephine hole in the recipient's cornea was 4.75 mm. The graft was kept in position by two fine-silk cross-sutures. Normal vision was obtained and was still present after six months. A color plate shows a marked clearing of the periphery of the cornea after the operation.

J. Hewitt Judd.

Laval, Joseph. Absorption lines of the cornea. *Arch. of Ophth.*, 1939, v. 22, Aug., pp. 257-261.

The literature is reviewed and a case reported in which one eye presented a central, grayish opacity of the cornea through which were coursing clear lines anastomosing with each other in many places. Between these transparent lines the opaque area was of unequal density and multiple fine straight lines of clearing were seen. The slitlamp revealed in the center of each clear line a dense white line which could be followed to the limbus where it was continuous with blood vessels. In the cornea proper the lumens were closed and empty. (Discussion.)

J. Hewitt Judd.

McDonald, R. and Pettit, H. The production of corneal ulcers in the rabbit. *Arch. of Ophth.*, 1939, v. 21, May, pp. 817-822.

The results of this investigation indicate that fairly standard staphylococcal ulcers suitable for experimental purposes can be produced by injecting living staphylococci into the corneas of rabbits previously sensitized by subcutaneous injection of specific heat-killed vaccine.

J. Hewitt Judd.

Moretti, Egisto. Perirrhaphy in the treatment of corneal ulcers and opacities and of interstitial keratitis. *Amer. Jour. Ophth.*, 1939, v. 22, Aug., pp. 882-886.

Mutch, J. R., and Richards, M. B. Keratoconus experimentally produced in the rat by vitamin-A deficiency. *Brit. Jour. Ophth.*, 1939, v. 23, June, pp. 381-386.

Keratoconus was produced experimentally as a sequel to acute xerophthalmia in rats on a vitamin-A-free diet. While the cornea regained its normal contour following several weeks of feeding with vitamin A, corneal nebulae and myopia continued as lasting defects. If vitamin A was given early the eyes cleared rapidly with no apparent abnormality, but if delayed the eyes became perforated and useless for further experiment. D. F. Harbridge.

Rose, Heinrich. The disease picture of blue sclerotics, abnormal brittleness of bone, and defective hearing (Adair-Dighton's syndrome). *Graefe's Arch.*, 1939, v. 140, pt. 2, pp. 278-302.

The history of this syndrome is reviewed, beginning with Eckmann's description in 1788 of familial fragility of bone, and including Spurway's report in 1896 of the combination of blue scleras with bone fragility. The author gives credit to Adair-Dighton for first recording the triad of blue scleras, brittle bones, and defective hearing; and reproduces his original paper (*The Ophthalmoscope*, 1912, v. 10, p. 188). Three families with the Adair-Dighton syndrome are reported. The etiology, pathology, roentgenographic findings, and associated lesions reported by many different writers are discussed. (Color photographs, roentgenograms, complete bibliography.)

Charles A. Perera.

Urbanek, J., and Roschkott, A. Influence of seasons and weather on the frequency curve of scrofulous keratoconjunctivitis. *Klin. M. f. Augenh.*, 1939, v. 102, May, p. 668.

It is a well-known fact that scrofulous keratoconjunctivitis is much more frequent in spring than in summer or winter. It is not clear whether the increased radiation of the sun in spring or the lack of light in winter is responsible. Since scrofulosis is a form of tuberculosis, the influence of the more intense radiation of the sun, which in spring is especially rich in ultraviolet, on the tubercle bacillus must be studied. The investigations are presented in tabular form.

C. Zimmermann.

7

UVEAL TRACT, SYMPATHETIC DISEASE AND AQUEOUS HUMOR

Davson, Hugh. The distribution of sodium between the aqueous humor and the blood plasma of cats. *Jour. of Physiology*, 1939, v. 96, July 14, p. 194.

Distribution of sodium between aqueous humor and blood serum was found to occur in a concentration ratio of 1.03, as compared to a theoretical value of 1.04. Blood drawn under nembutal anesthesia gave the same values as that drawn without anesthesia.

George A. Filmer.

Gördüren, S., and Sohr, H. Histologic and clinical investigations in sympathetic ophthalmia. *Klin. M. f. Augenh.*, 1939, v. 108, June, p. 830.

After enucleation following perforating injuries or operations, 428 globes were examined histologically with regard to signs of sympathizing inflammation. In 0.25 percent of the eyes with perforating injuries and in 0.045 percent of those with injuries

following operations positive histologic changes were found. Clinically, half of the former and all of the latter had shown signs of sympathetic ophthalmia. Sixty percent of the patients whose eyes had shown positive histologic findings or had been removed on account of suspicion of sympathetic ophthalmia were investigated after several years. In none had clinical signs of sympathetic ophthalmia occurred in the second eye.

C. Zimmermann.

Kemp, Robert. A note on chronic iridocyclitis with special reference to the sarcoidosis of Boeck. *Brit. Jour. Ophth.*, 1939, v. 23, July, pp. 455-460.

The disease is one of importance to the ophthalmologist because of its obscure etiology and poor prognosis. The course of the disease is chronically progressive and is not amenable to treatment. Sarcoidosis is not a cause in the majority of instances. (Tables, references.)

D. F. Harbridge.

Machado, N. R. Postinfectious optic neuritis and acute iridocyclitis. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 2, pp. 517-521. (See Section 11, Optic nerve and toxic amblyopias.)

Seager, L. D. Effect of potassium chloride on the normal and denervated iris. *Jour. Pharmacology and Exper. Therapeutics*, 1939, v. 66, June, p. 202. (See *Amer. Jour. Ophth.*, 1939, v. 22, July, p. 792.)

Sorsby, Arnold. Choroidal angiosclerosis with special reference to its hereditary character. *Brit. Jour. Ophth.*, 1939, v. 23, July, pp. 433-444.

A review of the literature with an etiologic consideration of the cases described. Case reports of familial

choroidal sclerosis are discussed. Further study and elucidation are recommended by the author. (Figures, references.)

D. F. Harbridge.

Theodore, F. H., and Lewson, A. C. Bilateral iritis complicating serum sickness. *Arch. of Ophth.*, 1939, v. 21, May, pp. 828-832.

The authors review the literature showing the vulnerability of the iris in allergic reactions and report the case of a man aged forty years who developed bilateral iritis during the course of serum sickness. This apparently is the first case to be recorded.

J. Hewitt Judd.

8

GLAUCOMA AND OCULAR TENSION

Igersheimer, Joseph. Can glaucoma influence transudation from the retinal vessels? *Ophthalmologica*, 1939, v. 97, June, p. 146.

The author observed a 42-year-old male with hypertension and with secondary glomerulonephritis or contracted kidney. The urea and uric-acid contents of the blood were extremely high. While under observation during the 1½ years preceding his death, a glaucoma simplex developed but signs of hypertensive retinal disease were conspicuously absent. The visual field and intraocular tension were not measured during the course of clinical examination. Findings of retrolaminar optic atrophy with small lacunae, seen in histologic preparations of the eye-balls and optic nerves, were considered sufficient evidence for the diagnosis of glaucoma. The author points out that it has not been demonstrated that vascular hypertension is a cause of glaucoma although the intraocular tension has been observed to vary with the blood pressure. The retrolaminar

atrophy may have been caused by morbid changes in the peripapillary blood vessels of Zinn or even in branches of the central artery within the optic nerve.

The second topic of interest is the question of whether the absence of retinopathy can be ascribed to the intraocular hypertension. In so far as it reduces the hydrostatic pressure-head, it reduces the force which acts in the transudation of fluid into the retinal tissue. F. Herbert Haessler.

Korte, Walter. Contribution to the heredity of glaucoma. *Klin. M. f. Augenh.*, 1939, v. 102, May, p. 664.

A mother with chronic glaucoma had two children with typical congenital hydrophthalmos. The author interprets this as transition of chronic glaucoma to hydrophthalmos by direct hereditary transmission. Another child of two years in the same village had typical congenital hydrophthalmos, but both parents were healthy. However, an hereditary relationship with the other family was found. C. Zimmermann.

Pincus, M. H. Nevus flammeus associated with glaucoma. *Arch. of Ophth.*, 1939, v. 21, May, pp. 741-745.

The literature is briefly reviewed and the case of a man aged 45 years is presented in which unilateral nevus flammeus was associated with glaucoma of the corresponding eye. The case illustrates that the glaucoma need not be of the infantile type; that blindness, total or partial, need not be associated with this condition; and that a change in the capillary permeability seems to be the best explanation for the phenomena observed in this disease.

J. Hewitt Judd.

Weinstein, Paul. Pathogenesis of thrombosis of the central retinal vein

and of consecutive glaucoma. *Brit. Jour. Ophth.*, 1939, v. 23, June, pp. 392-396. (See Section 10, Retina and vitreous.)

9

CRYSTALLINE LENS

Barraquer, I. The corneoscleral suture in intracapsular extraction of senile cataracts. *Ann. d'Ocul.*, 1939, v. 176, June, pp. 470-475.

After reiterating the advantages of his operation of "phacoerisis" and criticizing his critics the author describes briefly his method of closing the wound with six corneoscleral sutures. These sutures are placed in the sclera and cornea after the eye has been opened, using a very sharp needle and holding the cornea with Hess forceps while the needle is being introduced. If they are inserted properly they should decrease the incidence of anterior-chamber hemorrhage, vitreous prolapse, secondary reopening of the wound, and postoperative astigmatism. No cases are cited and no statistics are given.

John M. McLean.

Darby, W. J., and Day, P. L. Xylose as a cataractogenic agent. *Proc. Soc. Exper. Biology and Med.*, 1939, v. 41, June, p. 507.

It is known that cataracts may be experimentally produced by galactose. In this investigation another monosaccharide, xylose, was studied. Young rats fed xylose developed cataractous changes in the same length of time as those fed galactose, while controls receiving glucose showed no lens changes.

George A. Filmer.

Hilding, Anderson. Efficiency of various wound closures in prevention of prolapse of the iris after cataract

operations; experimental study. *Arch. of Ophth.*, 1939, v. 22, Aug., pp. 177-192.

Animal eyes were subjected to four different operative procedures and then tested as to their ability to withstand pressure. They were prepared and mounted on a special clamp in such a way that a measured amount of pressure could be applied to them either externally or internally. Each eye was tested under all four operative conditions. It was found that even with short limbal incisions, the wound would gape readily, and prolapse of the iris would occur at comparatively low pressures. Conjunctival flaps and pockets were essentially ineffective in reinforcing limbal incisions so as to prevent this complication. Sutures placed directly in the limbal incision were effective in holding the wound closed and preventing herniation of the iris. An opening in the iris which allowed the fluid to escape from the posterior chamber was a further protection against herniation.

J. Hewitt Judd.

Hilding, Anderson. **Mechanics of prolapse of the iris in cataract operations; clinical observations and a method of prevention.** *Arch. of Ophth.*, 1939, v. 22, Aug., pp. 171-176.

Based on observations in the Holland Ophthalmic Clinic in India it was found that prolapse of the iris is due primarily to imprisonment of the aqueous of the posterior chamber behind the iris when the cornea suddenly opens. Imprisonment of the aqueous occurs because the iris applies itself so closely against the posterior corneal surface about the breach in the wound that a relatively water-tight seal is formed. This seal may form in the presence of either a round or a keyhole pupil. An operative procedure has been

developed which will prevent prolapse of iris and incarceration after cataract extraction in practically all cases. This consists of two corneoscleral sutures placed at the 10:30 and 1:30-o'clock positions, incision within the loops at the limbus without conjunctival flap, and three tiny peripheral iridotomy openings at the 10, 12, and 2-o'clock positions.
J. Hewitt Judd.

Leech, V. M., and Sugar, H. S. **Reduction of postoperative complications in cataract operations with corneoscleral sutures.** *Arch. of Ophth.*, 1939, v. 21, June, pp. 966-975.

A study of the postoperative complications of prolapse of iris or vitreous, delayed closure of the anterior chamber, and hyphema was made in three groups of 150 cases each. The first group comprised those in which conjunctival flaps were used without sutures; the second, those in which conjunctival flaps were used with sutures; and the third, those in which corneoscleral sutures were used. The cases in each group in which complications occurred are tabulated and summarized. Postoperative complications were greatly diminished in the group in which conjunctival sutures were used and were further reduced in the group in which corneoscleral sutures were employed. The type of suture used is described and shown in a drawing.
J. Hewitt Judd.

Purtscher, Ernst. **Filaments of cotton in the anterior chamber after intracapsular cataract extraction.** *Klin. M. f. Augenh.*, 1939, v. 102, June, p. 844.

In six cases a successful intracapsular extraction was followed by perfectly smooth healing. Before discharge, examination with the slitlamp showed filaments of cotton on the iris. In only

two cases were a slight hyperemia of the surrounding vessels of the iris and a fine veil of connective tissue around the foreign body seen. Probably the foreign bodies were introduced by the spatula in replacing the iris.

C. Zimmermann.

Weekers, Roger. Survival of the lens in the method of De Haan-Bakker. Composition of the perfusion fluid. *Ophthalmologica*, 1939, v. 97, June, p. 159.

The De Haan-Bakker method of perfusion assures the life of the lens outside the organism for a long time. The culture medium is obtained by injecting Ringer's solution into the abdominal cavity of a rabbit and removing it after 2½ hours. This procedure enriches the solution so that its composition approaches that of the aqueous humor. In this study, the author has investigated certain physical properties and the chemical composition of the culture medium. F. Herbert Haessler.

Young, J. Paracentral capsule forceps and a grid vectis. *Brit. Jour. Ophth.*, 1939, v. 23, June, pp. 399-401.

The instruments and the operative technique are described, the advantages of each instrument being stressed. (Illustrations.) D. F. Harbridge.

10

RETINA AND VITREOUS

Abramowicz, I. On the localization of the meridian determined by perimetric measurement on the outside of the sclera. *Brit. Jour. Ophth.*, 1939, v. 23, July, pp. 482-483.

A figure illustrates the method described as being more simple than any other for this purpose.

D. F. Harbridge.

Bessière and Bruel. Comparative experimental study of the anatomic effects of perforating thermocauterization and diathermocoagulation of the eyeball. *Arch. d'Ophth. etc.*, 1939, v. 3, June, p. 481.

After reviewing at length the literature concerning the histologic study of the ocular tissue after retinal-detachment operations, the authors report a study of the effects of perforating thermocauterization (Gonin), perforating diathermocoagulation, and surface diathermocoagulation. Three series of three healthy rabbits each were used in the experiments, and the eyes were enucleated ten, twenty, and thirty days respectively after operation. They concluded that surface diathermy coagulation, unless pushed to the point of extensive necrosis, was not adequate. Perforating thermocauterization was apt to produce hemorrhages and vitreous traction bands. Since the purpose of the operation is to unite the retina to the pigment epithelium, any procedure which goes beyond this is mutilating. For that reason perforating diathermocoagulation, experimentally at least, is the method of choice. (Illustrations.) Derrick Vail.

Elwyn, Herman. Circulatory disturbances in retina in arteriosclerosis and in essential arterial hypertension. *Arch. of Ophth.*, 1939, v. 21, May, pp. 775-798.

The fundamental pathologic elements which underlie the local circulatory symptoms in these two conditions are presented in an attempt to correlate the clinical and ophthalmoscopic findings. The two components, organic, with changes in the vessels, and functional, with constriction of the vessels, produce similar local circulatory disturbances. Either is followed by dilatation of the terminal

units of the vascular system, precapillary arterioles, capillaries, and postcapillary venules, with constriction of the artery above. Depending on the degree, there occurs peristatic hyperemia with transudation of fluid, prestatic hyperemia with hemorrhages, or complete stasis with stoppage of the circulation or infarction. If the constriction is released the transudation and hemorrhages are absorbed. If interference with the blood flow persists but is not complete, the chronic suboxidation and subnutrition of the retina manifests itself by deposits of hyalin, fat, and lipoids. When infarction occurs, collateral circulation is established whenever possible. Hemorrhages that are too large to be absorbed stimulate connective-tissue formation and are either organized into scars or are encapsulated. J. Hewitt Judd.

Franceschetti, A., and Streiff, E. B. The relation between pressure in the retinal arteries and general blood pressure in diabetes. *Klin. M. f. Augenh.*, 1939, v. 102, May, p. 633.

Investigation indicated that in general hypertension with diabetes, the diabetes plays an essential part in the occurrence of retinal changes.

C. Zimmermann.

Friedman, Benjamin. Familial retinal degeneration leading to detachment and cataract formation. *Arch. of Ophth.*, 1939, v. 22, Aug., pp. 271-273.

A mother and seven children were studied and all but the oldest child were found to have peripheral retinal lesions consisting of small islands of degeneration and small retinal cysts. In two cases a circular retinal hole was visible. Two patients of those showing retinopathy have thus far escaped complications. All the others have had

either cataract or detachment or both. All the affected patients were adults and had the general characteristics of hyperpituitarism. It is noteworthy that the oldest child, a female, did not resemble the rest of the family in appearance and had inherited no ocular pathologic process. J. Hewitt Judd.

Hagedoorn, A. Angioid streaks. *Arch. of Ophth.*, 1939, v. 21, May, pp. 746-774, and June, pp. 935-965.

A case of angioid streaks and pseudoxanthoma elasticum is reported. The histologic findings in the two eyes enucleated post mortem are described and compared with descriptions found in the literature. Reconstruction of the defects found in Bruch's membrane is described, and it is concluded that this type of degeneration is specific for angioid streaks. In the center of the pathologic process, the degeneration of Bruch's layer was demonstrated to be a degeneration of the elastic fibers. Senile degeneration of Bruch's membrane most closely resembles the degeneration found in angioid streaks. The pathologic process described is compared with that found in choroidal arteriosclerosis, disciform degeneration of the macula, the ruptures found in myopia, and various other conditions.

Changes found in the choroid, retina, and other parts of the eye are discussed and a correlation is made of the fundus and histologic findings. The nature of this disease and of those diseases in which Bruch's layer is similarly affected is discussed. Thick-walled arteries differing from those in arteriosclerosis were found. The choroid was not atrophic but thickened (sclerotic). A degeneration was found in the limbal region of the cornea affecting the basal epithelial cells and Bowman's membrane. As an aid in investigating the

histologic changes, it is urged that enucleated eyes be preserved in a neutral solution of formaldehyde or alcohol to prevent the solution of calcium and iron. (Fundus photographs, photomicrographs.) J. Hewitt Judd.

Hollwish, Fritz. Spontaneous hole of the macula in eye with choked disc. *Klin. M. f. Augenh.*, 1939, v. 108, June, p. 849.

A man aged 18 years, who had a rapidly growing tumor of the hypophysis, showed choked discs and foci of cystic degeneration in both eyes and a hole in the macula of the left eye. This latter condition is ascribed to tearing of the foveal retinal strata by bulging of the disc and bursting of the little cysts. C. Zimmermann.

Krewson, W. E. History of the surgical treatment of retinal separation. *Arch. of Ophth.*, 1939, v. 22, Aug., pp. 292-312.

The surgical treatment of retinal detachment is reviewed under the headings of posterior sclerotomy, retinal sutures and trephining, galvanopuncture, electrolysis, vitreous injections, scleral excision, colmatage, etiologic factor, choroidialysis, Gonin's contribution, chemical cauterization, surface electrocoagulation, diathermy (Weve, Safar, and Walker), electrolysis, electrodiaphake, and combined methods. (Bibliography.)

J. Hewitt Judd.

Kyrieleis, Werner. Clinical and anatomic observations in albuminuric retinitis. *Graefe's Arch.*, 1939, v. 140, pt. 2, pp. 193-257.

The author has made a careful analysis of one hundred patients suffering from acute and chronic nephritis, secondary contracted kidney, and nephrosclerosis. There was no strict

parallelism between the renal and retinal findings. Anatomico-pathologic studies were made in 19 cases. The author concludes that the preliminary condition for the development of a retinitis is an unknown neurogenic or chemical process leading to a functional narrowing of the vascular stream. This is accompanied by a relatively mild elevation of blood pressure. A continuation of this process leads to permanent changes in the vessels and to retinal abnormalities (edema, hemorrhages, and deposits). In some instances the process may reverse after reaching a certain stage. Charles A. Perera.

Lambert, R. K. Paget's disease with angioid streaks of the retina. *Arch. of Ophth.*, 1939, v. 22, July, pp. 106-109.

The author adds two cases to the nine reported in the literature in which these two conditions are associated. Attempts to find some common factor between Paget's disease and pseudoxanthoma elasticum, which is commonly associated with angioid streaks, have been unsuccessful. J. Hewitt Judd.

Marshall, J. C. Case of a giant hole of retina. *Brit. Jour. Ophth.*, 1939, v. 23, June, pp. 369-373.

A male clerk experienced a retinal tear in a highly myopic eye, the sight of the other eye having been lost several years before. Since the tear was large and the retina rolled back, a two-stage operation was done, the first a puncture to permit the retina to flatten, the second to close the tear. There was no noticeable improvement following the completed operation, but two years later the patient returned with a fully developed cataract which was removed. Later, a needling of the capsule resulted in vision of 6/24. (Figures.)

D. F. Harbridge.

Puntenny, L., and Osborne, S. L. Temperature changes and changes in caliber of retinal blood vessels after short-wave diathermy. *Arch. of Ophth.*, 1939, v. 22, Aug., pp. 211-227. (See Section 2, Therapeutics and operations.)

Rosenthal, C. M. Changes in angioscotomas associated with the administration of sulphanilamide. *Arch. of Ophth.*, 1939, v. 22, July, pp. 73-81.

In two cases, during the administration of sulphanilamide, the angioscotomas showed a narrowing which disappeared four or five days after withdrawal of the drug. Since there was no modification of the scotomas in one case when oxygen was administered, it is thought that there may be a relative increase in the oxygen present in the region of the retinal synapse.

J. Hewitt Judd.

Sanders, T. E. Intermittent occlusion of the central retinal artery. *Amer. Jour. Ophth.*, 1939, v. 22, Aug., pp. 861-869.

Santoni, A. The metabolic retinal interchange after interruption of the retinal circulation. *Ann. di Ottal.*, 1939, v. 67, April, p. 299.

Santoni studied the retinal cellular respiratory changes after the circulation in the blood vessels had been artificially obstructed for varying periods of time. The animals employed in the experiments were rabbits and rats and the periods during which the retinal circulation had been suspended varied from 15 to 90 minutes. The different amounts of oxygen found in the normal retina and in that in which the circulation had been interrupted were then determined by the direct and the indirect method of Warburg, the amount being calculated hourly. An

increase in oxygen consumption was found when the circulation had not been interrupted for more than 30 minutes. After longer periods the consumption progressively diminished.

The author attributes the increased consumption of oxygen to an interference with cellular interchange brought about by activation of autolytic ferments and liberation of fatty-acid-like substances actively augmenting the consumption of oxygen by the tissues. The diminution noted in the second period is due to the diminished vitality of the retinal elements. This is increased by the vulnerability of highly organized retinal structures and the difficulty of eventual restoration of retinal functions after a prolonged stoppage of the circulation of the blood. This deprivation of the blood supply has a clinical bearing in such cases as that of embolism of the central retinal artery. (Bibliography.) Park Lewis.

Weinstein, Paul. Pathogenesis of thrombosis of the central retinal vein and of consecutive glaucoma. *Brit. Jour. Ophth.*, 1939, v. 23, June, pp. 392-396.

The cases observed by the author, mostly aged persons with increased systolic pressure and tonoscillogram readings of considerable amplitude, indicate that in cases of thrombosis of the central retinal vein there is an alteration of the entire system of vessels and a deficiency of the musculature of the arteries. Walls of the small vessels become thickened, the endothelium showing hyaline degeneration and hyperplasia. In thrombosis of the central retinal vein, glaucoma follows if the main branch has been obliterated. The author states that X-ray treatment is indicated. (One table.)

D. F. Harbridge.

Weinstein, Paul. Significance of venous pulsation of the eyeground. *Brit. Jour. Ophth.*, 1939, v. 23, June, pp. 396-398.

Two theories prevail concerning the origin of venous pulsation. One mechanism suggested is a wave of arterial pulsation conveyed through the capillaries into the vein. The other works by a diminution of the intracranial pressure, pulsation appearing when the pressure within the central retinal vein has been reduced to the level of the ocular tension. D. F. Harbridge.

Weve, H. J. M. Development and treatment of detachment of the retina. *Klin. M. f. Augenh.*, 1939, v. 102, May, p. 609.

In this lecture Weve shows innovations in the technique of examination and operation by diathermy. He emphasizes the value of detailed drawings of the whole fundus, and repeats the principles of his operative technique. He reports his physical and chemical investigations of the subretinal fluid and discusses the ruptural forms of detachment. His operative results show cures in 80 percent of all cases. If ophthalmologists recognize their cases sufficiently early and submit them to immediate treatment the cures may reach nearly 100 percent.

C. Zimmermann.

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Almeida, A. de. Familial hereditary optic atrophy (Leber's disease). *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 2, pp. 442-445.

The author reports 12 cases of Leber's disease all of which presented reduction in the caliber of the optic

foramen, as well as enlarged sphenoidal sinuses. To these findings he ascribes great etiologic importance, believing that defective development of the sphenoidal bone may affect the optic nerve by gradual pressure. When the bone has finally developed, the disease ceases to progress.

Ramon Castroviejo.

Cibis, Paul. Contribution to the heredity of familial atrophy of the optic nerve (Leber's disease). *Klin. M. f. Augenh.*, 1939, v. 108, June, p. 824.

The genealogic tree of six generations with 108 members showed four certain cases of Leber's disease. The direct transmission of the disease through a diseased male to another male and from him to a female was peculiar. It constituted an exception to Lossen's rule, according to which diseased males do not propagate the affection. C. Zimmermann.

Dracontaidis, Constantin. Inversion of the color fields in quinine amblyopia. *Ann. d'Ocul.*, 1939, v. 176, June, pp. 437-450.

Eight cases of quinine amblyopia are reported. In seven of these there was marked reduction of the visual fields for light, and in six an inversion of the color fields. The amount of damage done seemed to be proportional to the quantity of quinine absorbed and loss of vision was manifested almost immediately after ingestion of the drug. The author believes that inversion of the color fields is the result of selective intrinsic poisoning of the rods and cones. Immediate treatment including lavage of the stomach is advised, but all forms of later therapy (including the various vasodilators) are considered ineffectual. John M. McLean.

NEWS ITEMS

Edited by DR. H. ROMMEL HILDRETH

640 S. Kingshighway, Saint Louis

News items should reach the Editor by the twelfth of the month

DEATHS

Dr. Thomas Waller Floyd, Peoria, Illinois, died June 5, 1939, aged 66 years.

Dr. Felix Chon, New York City, died June 2, 1939, aged 78 years.

Dr. Joseph Mark Walsh, Rapid City, South Dakota, died June 26, 1939, aged 61 years.

Dr. Howard McIlvain Morton, Vincentown, New Jersey, died July 19, 1939, aged 71 years.

Dr. Eugene Silas Strout, Minneapolis, Minnesota, died June 25, 1939, aged 76 years.

SOCIETIES

The International Council of Ophthalmology met in London at the Royal Society of Medicine on April 19, 1939. Present were: Drs. Nordenson (chairman), Ehlers (honorary secretary), Pflüger (honorary treasurer), Paton, v. Grosz, Cavara, Terrien, MacCallan, Bailiart, Löhlein, Knapp, Tooke, and Sinclair.

The treasurer reported that the assets of the council amounted to 2,232 Sw. frcs. The president announced that the German government had accepted to take over the responsibilities undertaken by the former Austrian government with regard to the next congress. Prof. J. Meller of Vienna was nominated president of the next congress. The following themes were chosen for the discussions: 1) The plastic operations on the eyeball; 2) The pathology of retinal detachment, including the biology and pathology of the vitreous body.

It was decided to lay the question of internationalizing the determination of the axes of astigmatism before the next congress. The next meeting of the council was to be held in Paris in 1940, on the day before the opening of the annual meeting of the Société Française d'Ophtalmologie.

The fifth annual meeting of the Mississippi Valley Medical Society was held at Burlington, Iowa, September 27, 28, 29, 1939.

PERSONALS

E. P. Wilbur, M.D., and R. B. Fast, M.D., announce the association of Don Marshall, M.D., formerly assistant professor of ophthalmology, University of Michigan, and recently head of the Department of Ophthalmology, Geisinger Hospital, Danville, Pennsylvania. Practice limited to diseases of the eye, 1410 American National Bank Building, Kalamazoo, Michigan.

Dr. T. Hewiston Brown (Edinburgh) received the first award of the Treacher Collins Prize for his essay on "Cerebrospinal disease and its relation to the optic nerve." Essays of Drs. S. Nevin and N. S. Alock were highly commended.

The Ophthalmological Society of Australia has elected Miss Ida Mann to honorary membership.

The Royal Society of Medicine, Section of Ophthalmology, has nominated Malcolm Hepburn as president for the year 1939-1940.

The International Organization against Trachoma met at London on April 21, 1939. Dr. MacCallan was designated to write a brochure on the subject of trachoma for general practitioners in trachomatous countries.

Dr. Karl Ascher, formerly Professor Extraordinarius in Ophthalmology at the German University at Prague has emigrated to this country and has been appointed Resident Fellow in the Department of Ophthalmology, College of Medicine, University of Cincinnati. Dr. Ascher had succeeded Professor Elschnig as head of the Department of Ophthalmology of the German University of Prague. He was forced to give up his position because of political reasons. American ophthalmologists will welcome such a distinguished colleague as Professor Ascher.

NEW

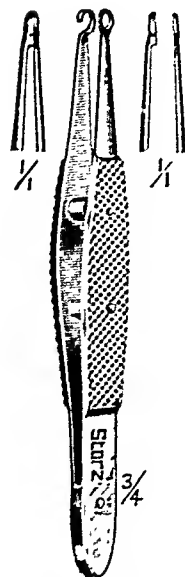
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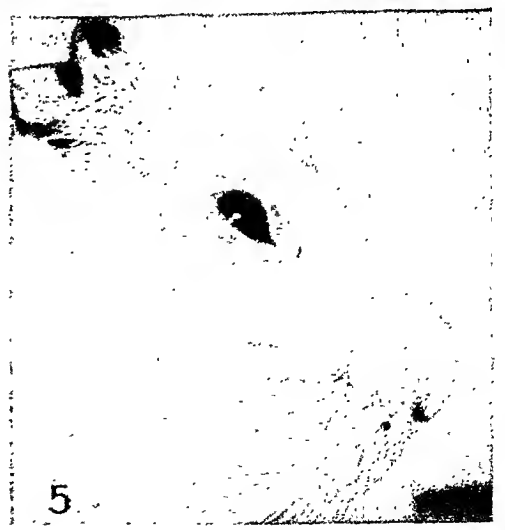
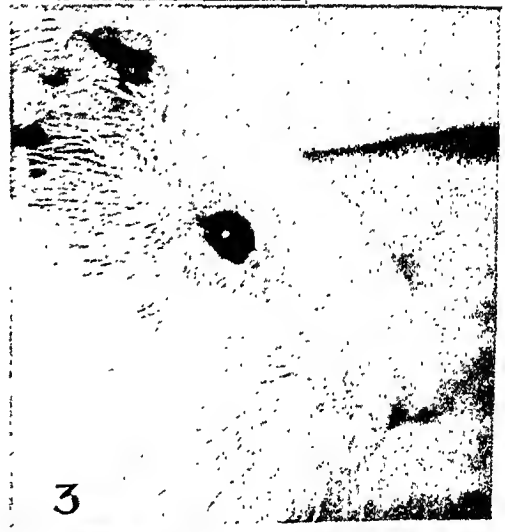
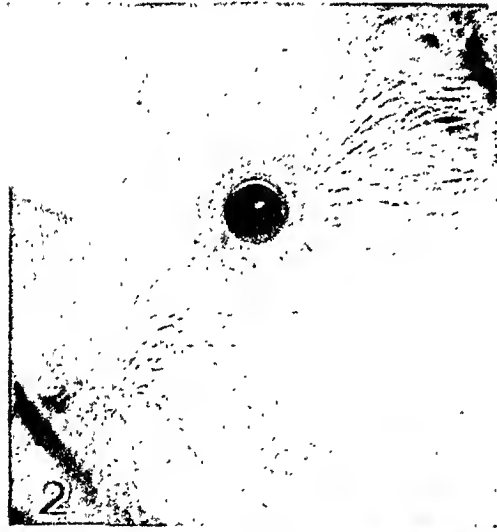
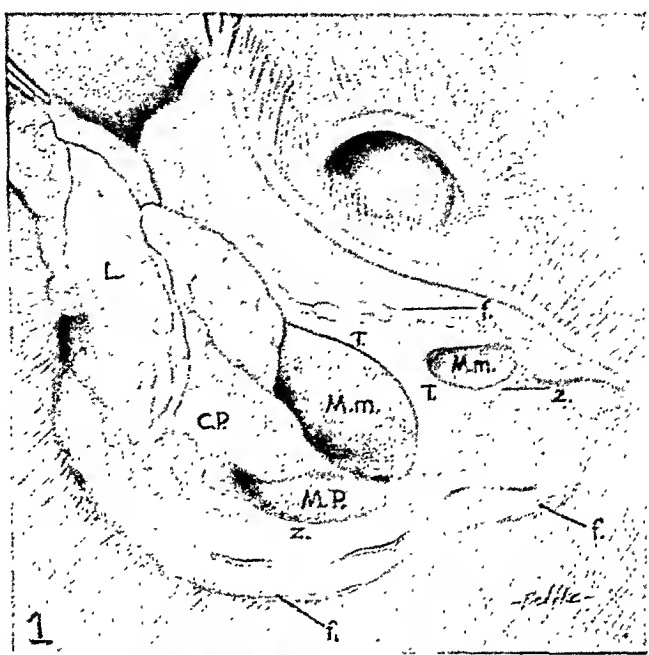
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THE ROLE OF THE CERVICAL SYMPATHETIC GANGLIA AND
MÜLLER'S ORBITAL MUSCLE IN EXPERIMENTAL
EXOPHTHALMOS*

GEORGE K. SMELSER, PH.D.
New York

A tonic contraction of Müller's orbital muscle has been frequently cited as the immediate cause of proptosis in both clinical and experimental exophthalmos. Activation of Müller's muscle of the lid and orbit through sympathetic stimulation by drugs, toxins, and electric current causes some proptosis and widening of the palpebral fissure in experimental animals (MacCallum and Cornell,¹ Code and Essex,² Marine, Spence, and Cipra).³ Such evidence coupled with the production of ptosis and enophthalmos by removal of the cervical sympathetic ganglia forms the basis of the concept that the action of the sympathetic nerves and smooth musculature of the orbit is responsible for exophthalmos found clinically. This theory carries with it the assumption that the swelling of the orbital tissues and the pathological changes found in clinical cases are secondary. In addition such hypotheses ignore the great difference in the orbital anatomy of man and laboratory animals.

* From the Institute of Ophthalmology, Columbia University. Read before the Association for Research in Ophthalmology in Saint Louis, May 16, 1939.

In man, Müller's orbital muscle consists of a narrow band of smooth muscles, a few millimeters in width, bridging the inferior orbital fissure.^{4, 5} Because of the extent and distribution of its fibers it is generally agreed among anatomists that it is incapable of creating sufficient pressure on the orbital content to produce an exophthalmos. This may explain why MacCallum and Cornell¹ failed to observe exophthalmos following attempts to stimulate Müller's muscle in man by applying an electric current to the cervical sympathetic ganglia. However, the Müllerian orbital muscle of the common laboratory animals consists of an extensive thin sheet of connective tissue and smooth muscle fibers that spans a wide inferior orbital fissure and forms the entire floor of the orbit. Since the orbital contents rest on, and to some extent are supported by, this muscle its contraction can create pressure behind the eye and cause some proptosis.

Within recent years it has been shown that injection of an extract of pituitary gland produces an exophthalmos very similar to the clinical type (Schockaert,⁶

PLATE 4 (SMELSER).

FIG. 1. DRAWING OF A DISSECTION OF A GUINEA-PIG ORBIT SHOWING MUELLER'S MUSCLE. L, LACRIMAL GLAND; F, SUBCUTANEOUS FASCIA INCLUDING ORBICULARIS AND ORBITAL SEPTUM; T, TENDON; M.M., MUELLER'S ORBITAL MUSCLE; Z, ZYGOMATIC ARCH. C.P., CORONOID PROCESS OF THE MANDIBLE; M.P., MUSCULUS PTERYGOIDEUS.

FIG. 2. NORMAL EYE OF A CONTROL GUINEA-PIG.

FIG. 3. EYE OF A CONTROL GUINEA PIG FOLLOWING REMOVAL OF MUELLER'S ORBITAL MUSCLE. THE SYMPATHETIC INNERVATION IS COMPLETE.

FIG. 4. EYE OF CONTROL GUINEA PIG SHOWING THE PTOSIS CAUSED BY EXTIRPATION OF THE CERVICAL SYMPATHETIC GANGLION. MUELLER'S ORBITAL MUSCLE IS INTACT. COMPARE WITH FIGURES 2 AND 3.

FIG. 5. EYE OF A CONTROL GUINEA PIG AFTER REMOVAL OF BOTH THE CERVICAL SYMPATHETIC GANGLION AND MUELLER'S ORBITAL MUSCLE. COMPARE WITH FIGURES 3 AND 4.

Loeb,⁷ Smelser,⁸ Friedgood⁹). In addition to the ocular signs, a thyroid hyperplasia is developed by this treatment which closely resembles that found in Graves's disease (Loeb and Bassett,¹⁰ Severinghaus¹¹). The exophthalmos can be produced in thyroidectomized animals (Marine *et al.*,¹² Smelser¹³) and is more extreme in hypo- than in hyperthyroidism (Smelser¹⁴). The orbital contents of these animals are increased in weight, all of the retrobulbar tissues being involved excepting the ventral lacrimal gland, which lies below and temporal to the globe (Smelser¹³). The hypertrophy of the fat and muscles assumes particular importance because of the similar condition of these structures in cases of clinical exophthalmos (Burch,¹⁵ Thomas and Woods,¹⁶ Naffziger,¹⁷ Moore,¹⁸ and Thomson¹⁹). The similarity is further emphasized by the pathological changes found in these tissues. Sections show an invasion of the muscles and, to a greater degree, of the fat by an edematous infiltrate accompanied by lymphocytes. The infiltrating material is similar in appearance and staining properties to that found in clinical cases.^{8, 13} The proptosis in this type of exophthalmos persists *post mortem*, and the amount of edematous infiltrate as well as the increase in retrobulbar tissue is unaffected by removal of the cervical sympathetic ganglia. Since it appears that an exophthalmos closely approaching the type found clinically has been produced it is of great importance to determine if Müller's orbital muscle is involved in these changes.

Even though the proptosis so produced is not caused directly by contraction of the smooth-muscle fibers, it is conceivable that by their action on the veins draining the orbit some of the effects noted might occur. Removal of the cervical sympathetic ganglia, as done in the earlier experiments, does not obviate the

possibility that the exophthalmos-producing factors contained in the extracts may act directly on the denervated smooth-muscle fibers. For these reasons a series of experiments has been carried out to determine whether or not extirpation of Müller's orbital muscle or of the sympathetic ganglia modifies experimentally produced exophthalmos.

METHODS

Forty-seven young adult guinea pigs were thyroidectomized. In approximately one third of the animals the cervical sympathetic ganglia and fibers were left intact. In the second group the sympathetic ganglia on the right side only were removed and in the third group the ganglia were removed bilaterally. After a short recovery period Müller's orbital muscle was removed from the right orbit of all animals in each group.

Under ether anesthesia an incision was made through the skin just over the zygomatic arch, curving upward temporally between the eye and ear. The skin was then undermined and separated from the underlying fascia, which consists of the orbicularis and orbital septum. This fascia was then incised, care being taken not to injure the facial nerve. In this manner the ventral lacrimal gland was exposed and retracted as shown in figure 1. This procedure exposed Müller's orbital muscle from below so that with careful illumination each step of its dissection could be seen. During this procedure the globe was protected with ointment. After removal of the thin sheet of muscle the lacrimal gland was replaced, and the skin and fascia sutured separately. Recovery has always been uneventful, the moderate reaction subsiding within one or two days.

Following a one or two weeks' recovery period, the guinea pigs were injected with an anterior pituitary extract for ap-

proximately 45 days. An amount of extract equivalent to 200 mg. acetone-dried, beef-anterior-pituitary glands was given daily for three weeks and then increased to 400 mg. for two weeks. During the final 10-day period the dosage administered was 500 mg. daily. The extract was prepared as described earlier (Smelser²⁰), and was essentially a well-tolerated preparation that contained a mixture of gonad, thyroid, adrenal, and probably growth-stimulating hormones. At the end of the injection period the animals were killed with illuminating gas and an autopsy was performed.

RESULTS

Removal of the cervical sympathetic ganglia produced, as expected, marked ptosis and enophthalmos (fig. 4*). The enophthalmos undoubtedly resulted from the relaxation of the orbital muscle of Müller, and the ptosis from a similar condition of the unstriated muscle in the lids. These effects are, to a considerable degree, apparently permanent in the guinea pig, for they have persisted in some animals for well over a year and a half.

Extirpation of Müller's orbital muscle produced a marked, permanent effect on the position of the globe. Due to the removal of the support of the orbital contents, the globe sank inward so that a definite enophthalmos occurred. In a sense this operation may be compared with that of a decompression of the orbit. Here the floor of the orbit was destroyed and its contents allowed to expand downward instead of upward as in the clinical cases when the roof of the orbit has been

removed. Associated with this enophthalmos a ptosis occurred (fig. 3) which probably was the result of at least two factors. Because of the regression of the bulb into the orbit some support of the lids was withdrawn, thus allowing them to droop. A second factor which may have affected the lower lid was the formation of connective tissue following the operative procedure. In view of the excellent mobility of the lids in these animals it does not seem probable that this was of prime importance. The degree of enophthalmos produced by removing Müller's muscle was apparently greater than that obtained by extirpation of the cervical sympathetic ganglion. Unilateral removal of the orbital muscle of a guinea pig from which the sympathetic ganglia have been taken out on both sides resulted in a more marked enophthalmos on the side operated on (figs. 5 and 8). This would seem to indicate that, although relaxed, when deprived of its innervation the smooth muscle sheet still offers considerable support to the orbital contents.

Injection of the pituitary extract produced a definite exophthalmos in 23 of the 28 experimental animals, a proportion of positive responses comparable to that obtained in other experiments. Exophthalmos was easily detected in the normally innervated eyes that were not operated on, but in those cases in which a ptosis had been created by removal either of the sympathetic fibers or Müller's muscle a careful comparison with controls that had undergone operation was necessary (fig. 7). Ptosis tended to minimize the degree of proptosis because in the living animal the position of the globe is judged largely on its relation to the lids. In addition, all of the eyes with a ptosis were enophthalmic at the beginning of the treatment. However, following careful examinations it appeared that surgical removal of the smooth muscle of

* All of the guinea-pigs figured had been thyroidectomized, and in those specimens from which either the cervical sympathetic ganglia or Müller's muscle had been removed the photographs were taken after recovery was complete. The control animals were not injected. The photographs of the guinea pigs were prepared by Mr. Adolph Marfaing.

the orbit and/or of the sympathetic ganglia innervating it did not seem sensibly to delay protrusion of the globe. In all cases the proptosis eventually obtained did not equal that found in the eyes that were not operated on. Due to this inequality, most of the animals appeared to have a unilateral exophthalmos (fig. 7).

Because of the difficulty in judging the degree of exophthalmos in the living guinea pig a careful examination was made at autopsy after removal of the skin and lids, where the relation of the globe to skull and orbit could be readily determined. Under these conditions the effects of injections on normal orbits and those operated upon were readily demonstrable.

The enophthalmos caused by removing the orbital muscle was clearly seen in the skinned post-mortem preparations of controls. Ablation of the sympathetic ganglia, however, is apparently without this effect. Therefore, in all of the animals the eye that was not operated upon was slightly more prominent than the other (figs. 12, 13, 14).

In all three groups of animals the effect of anterior-pituitary injections on the post-mortem protrusion of the globe was marked. A definite exophthalmos was produced in normally innervated orbits,

both the intact and those that had been operated on (fig. 9). In the second group the sympathetic innervation to the right eye had been removed together with the smooth muscle. The exophthalmos in these animals was indistinguishable from that of the first series (fig. 10). The cervical sympathetic ganglia were removed on both sides of the animals of the third group. In these it can be seen that exophthalmos produced by hypophyseal injections is independent of both the sympathetic nerves and Müller's smooth orbital muscle (fig. 11). Some inequality in the protrusion of the eyes was seen in all of the exophthalmic animals, just as noted in the controls.

At autopsy the orbital contents were removed and carefully dissected. The orbital fat, both lacrimal glands, the extraocular muscles, and bulb were weighed separately and fixed for histological examination. In all cases the tissues of the orbits that had been operated on were healthy, and the circulation was normal. Some increase in the amount of connective tissue in the orbits from which the smooth muscle had been removed was found, which probably resulted from the operative trauma. This reaction was sufficient to increase the average weight of the retrobulbar tissue of the orbits oper-

PLATE 5 (SMELSER).

FIG. 6. A GROUP-I CONTROL. THE LEFT EYE IS NORMAL, THE RIGHT IS ENOPHTHALMIC DUE TO REMOVAL OF MUELLER'S ORBITAL MUSCLE. THE SYMPATHETIC NERVES ARE INTACT.

FIG. 7. AN EXOPHTHALMIC GUINEA PIG OF GROUP I. BOTH EYES ARE NORMALLY INNERVATED, AND MUELLER'S MUSCLE HAS BEEN REMOVED. O.D. COMPARE WITH FIGURE 6.

FIG. 8 A GROUP-III CONTROL GUINEA PIG. THE CERVICAL SYMPATHETIC GANGLIA HAVE BEEN REMOVED BILATERALLY AND MUELLER'S MUSCLE FROM THE RIGHT ORBIT. COMPARE WITH FIGURE 6.

FIG. 9.* A GROUP-I EXOPHTHALMIC GUINEA PIG. THE CERVICAL SYMPATHETIC GANGLIA ARE INTACT BUT MUELLER'S MUSCLE HAS BEEN REMOVED O. D. NOTE THE SLIGHT DIFFERENCE IN PROTRUSION BETWEEN THE RIGHT AND LEFT EYES. COMPARE WITH FIGURES 11 AND 12.

FIG. 10.* A GROUP-II EXOPHTHALMIC GUINEA PIG. THE SYMPATHETIC INNERVATION AND MUELLER'S ORBITAL MUSCLE OF THE RIGHT EYE HAD BEEN REMOVED. THE INNERVATION OF THE LEFT EYE IS NORMAL. COMPARE THE RIGHT EYE WITH THAT IN FIGURE 9 AND THE CONTROL, FIGURE 13.

FIG. 11.* A GROUP-III EXOPHTHALMIC GUINEA PIG. THE CERVICAL SYMPATHETIC GANGLIA HAD BEEN REMOVED BILATERALLY, AND MUELLER'S MUSCLE FROM THE RIGHT ORBIT. NOTE THE DIFFERENCE IN PROTRUSION BETWEEN THE RIGHT AND LEFT EYES. COMPARE WITH FIGURES 9 AND 14.

FIG. 12.* A GROUP-I CONTROL. THE CERVICAL SYMPATHETIC GANGLIA ARE INTACT, BUT MUELLER'S MUSCLE HAD BEEN REMOVED FROM THE RIGHT ORBIT. NOTE THE DIFFERENCE IN PROTRUSION CAUSED BY THIS OPERATION.

FIG. 13.* A CONTROL OF GROUP II. MUELLER'S ORBITAL MUSCLE AND THE CERVICAL SYMPATHETIC GANGLION HAD BEEN REMOVED ON THE RIGHT SIDE. THE LEFT EYE IS NORMAL.

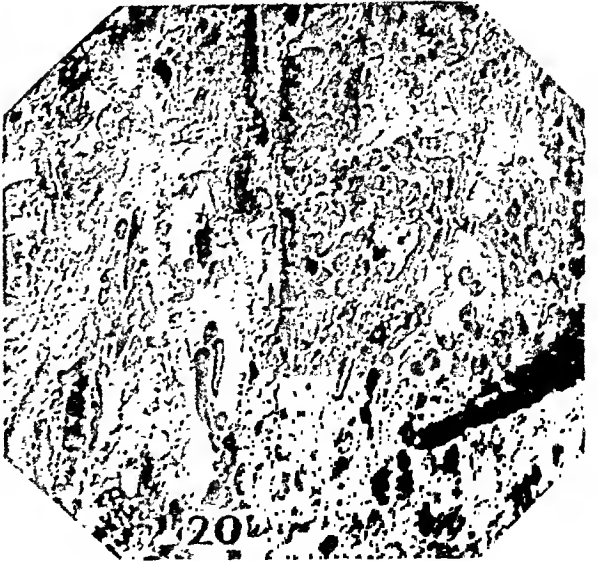
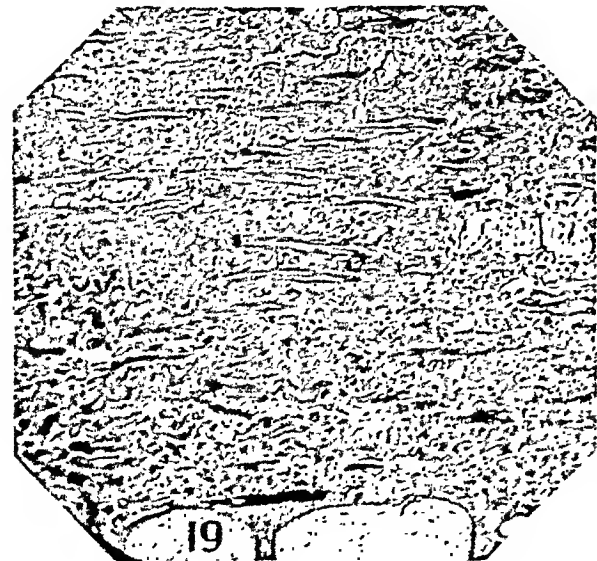
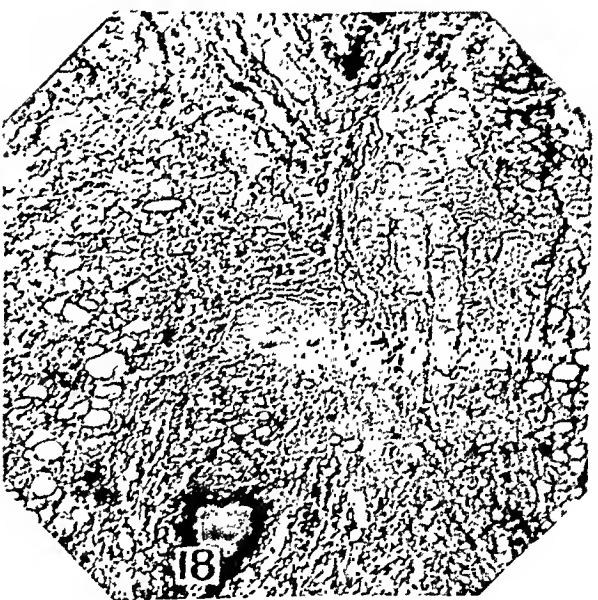
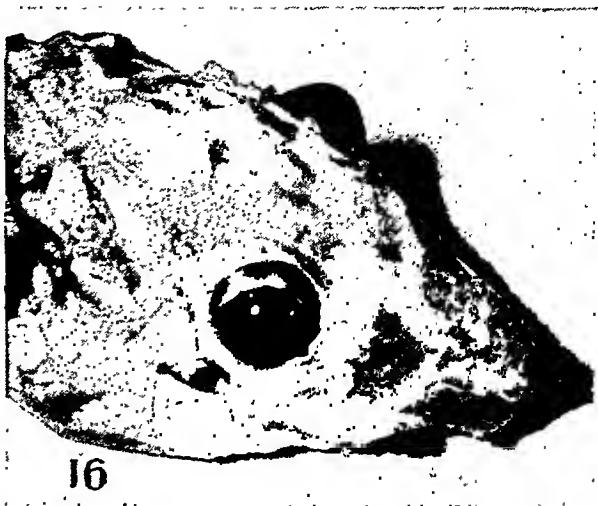
FIG. 14.* A CONTROL OF GROUP III. THE CERVICAL SYMPATHETIC GANGLIA HAVE BEEN REMOVED ON BOTH SIDES AND MUELLER'S MUSCLE FROM THE RIGHT ORBIT. NOTE THE DIFFERENCE IN PROTRUSION BETWEEN THE RIGHT AND LEFT EYES. THE UVEAL TRACT OF THIS ANIMAL IS PIGMENTED.

* Figures 9 to 16 are of control and exophthalmic guinea pigs photographed *post mortem* after removal of the skin and lids in order to demonstrate the relation of the bulb to the skull and orbit.



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ated on, in both the experimental and control series. Careful search for remnants of the sheet of smooth muscle was made in each case.

In all three groups of the injected animals the orbital contents were increased in weight. The hypertrophy of the orbital contents (table 1) was not affected by removal of the cervical sympathetic ganglia. In the left eyes of groups II (normally innervated eyes) and III (sympathetics removed), where the closest comparison can be made, the orbital-tissue hypertrophy was 28 and 31 percent, respectively.

Removal of Müller's orbital muscle did not affect the hypertrophy of the retrobulbar tissue; indeed, in all three groups the orbits that had been operated on were the heaviest. Furthermore, extirpation of the cervical sympathetic ganglia in addition to the removal of Müller's muscle did not inhibit the increase in orbital contents. Comparison of the tissue weights of the right orbits of groups I (innervations intact, Müller's muscle removed) and III (sympathetic innervation and Müller's muscle removed) revealed an increase of 28 and 30 percent, respectively.

As reported in earlier experiments, all of the orbital tissues were involved in the hypertrophy excepting the ventral lacrimal gland. The more dorsal lacrimal (Harderian gland) did become hypertrophied and was of great importance in these experiments because of its large

size. The orbital fat and connective tissue, however, underwent the greatest relative increase. The extraocular muscles were highly consistent both in the control weights and in the degree of hypertrophy.

HISTOLOGY

In general the histological structure of the orbital fat was, with but one noteworthy difference, as described in earlier reports (Smelser^{8, 13, 22}). In the operated-on orbits of both controls and injected animals more than the usual amount of connective tissue was noted. In the orbital fat of two of the controls some edema was found in amounts larger than is usually seen. It may be that some inflammatory reaction following removal of Müller's orbital muscle was responsible in these two instances. The fat tissue of the exophthalmic animals showed marked infiltration of an edematous material that penetrated into the loose connective tissue and among the fat cells (fig. 18). The condition was found to exist in tissue from animals from which the cervical sympathetic ganglia had been removed bilaterally and in orbits lacking Müller's orbital muscle.

Sections of the extraocular muscles revealed a condition similar to that noted in the examination of orbital fat. Muscles of both controls and exophthalmic animals contained in some cases more than the normal amount of connective tissue.

PLATE 6 (SMELSER).

FIG. 15.* A PROFILE VIEW OF AN EXOPHTHALMIC GUINEA PIG OF GROUP III TO SHOW THE DEGREE OF PROTRUSION OF THE EYE. THE CERVICAL SYMPATHETIC GANGLIA HAVE BEEN REMOVED BILATERALLY. MUELLER'S MUSCLE HAD BEEN REMOVED FROM THE RIGHT, BUT IS INTACT IN THE LEFT ORBIT. COMPARE WITH FIGURE 16.

FIG. 16.* A PROFILE VIEW OF A CONTROL GUINEA PIG OF GROUP III. THE CERVICAL SYMPATHETIC GANGLIA HAVE BEEN REMOVED BILATERALLY. MUELLER'S MUSCLE HAD BEEN REMOVED FROM THE RIGHT SIDE, BUT IS INTACT IN THE LEFT ORBIT.

FIG. 17. PHOTOMICROGRAPH OF ORBITAL FAT FROM THE RIGHT ORBIT OF AN UNINJECTED CONTROL GUINEA PIG OF GROUP III.

FIG. 18. ORBITAL FAT FROM A GROUP-III EXOPHTHALMIC GUINEA PIG. THIS SPECIMEN WAS REMOVED FROM AN ORBIT DEPRIVED OF BOTH MUELLER'S MUSCLE AND SYMPATHETIC INNERVATION THROUGH THE CERVICAL GANGLIA. NOTE THE LARGE AMOUNT OF EDEMATOUS INFILTRATE.

FIG. 19. EXTRAOCULAR MUSCLE FROM THE RIGHT ORBIT OF AN UNINJECTED GROUP-III CONTROL GUINEA PIG.

FIG. 20. AN EXTRAOCULAR MUSCLE FROM AN EXOPHTHALMIC GUINEA PIG OF GROUP III. NOTE THE EXTENSIVE INVASION OF THE TISSUE BY A LIGHTLY STAINING EDEMATOUS INFILTRATE. THE MUELLER'S MUSCLE OF THIS ORBIT AND BOTH CERVICAL SYMPATHETIC GANGLIA HAD BEEN REMOVED.

TABLE 1

THE EFFECT OF ANTERIOR-PITUITARY-EXTRACT INJECTIONS ON THE WEIGHT OF RETROBULBAR TISSUE IN ORBITS DEPRIVED OF MÜLLER'S MUSCLE AND/OR INNERVATION THROUGH THE CERVICAL SYMPATHETIC GANGLIA

Injected Series											
Group I Sympathetic Ganglia Intact				Group II Right Sympathetic Ganglion Out				Group III Both Sympathetic Ganglia Out			
Animal Num- ber	Body Wt. gm.	Total Weight of Retrobular Tissues, mg.		Animal Num- ber	Body Wt. gm.	Total Weight of Retrobular Tissues, mg.		Animal Num- ber	Body Wt. gm.	Total Weight of Retrobular Tissues, mg.	
O.D.	O.S.	O.D.	O.S.	O.D.	O.S.	O.D.	O.S.	O.D.	O.S.	O.D.	O.S.
663	450	983	885	650*?	430	938	949	566	460	1228	1216
665	490	1028	978	648	450	1007	918	527*	490	827	748
570	580	998	994	575	490	1077	1044	652	520	868	942
659	610	1095	950	579	520	1189	1119	651	530	734	820
562	615	1183	1161	576	535	1097	936	657	530	1046	928
543*	630	823	857	655*	555	874	750	567	550	1054	1003
661	635	1182	1048	577	570	1007	1011	654*?	565	959	911
660	645	1216	1134	573	630	1110	1099	653	625	1060	977
664	650	1094	1139	578	670	1274	1247	564	710	1272	1296
				647	695	1069	993				
9 cases Av.				10 cases 554 1064 1007				9 cases 553 1005 982			
				Uninjected Control Series							
583	430	729	652	636	430	717	666	616	415	687	648
638	440	776	670	674	480	743	677	565	415	773	741
614	530	884	739	637	520	773	736	672	510	673	719
625	585	863	811	640	660	897	870	619	515	845	773
629	700	913	793	572	720	1088	996	671	540	698	684
612	770	847	778	639	740	877	788	621	615	787	803
								644	785	963	889
6 cases Av.				6 cases 591 839 789				7 cases 542 775 751			

Müller's orbital muscle was removed from the right orbit in each case; the left orbit remained intact.

* No exophthalmos produced.

*? Questionable exophthalmos.

Usually only one or two muscles were affected. In the muscles of the exophthalmic series considerable amounts of an edematous infiltration were observed (fig. 20). This infiltration did not invade all parts of a muscle equally nor all muscles of an orbit. No modification of the cell structure of the muscle fibers was observed. These changes occurred in the right orbits of group III, which had been deprived of both cervical sympathetic ganglia as well as Müller's orbital muscle. Several animals of the injected series showed no infiltration in the sections studied. A few sections of control mus-

cles contained much connective tissue accompanied by some infiltration similar to that found in exophthalmic animals and in the orbital fat of a few controls. The marked variation in the degree of edematous infiltration found in these muscles is in keeping with earlier reports and the condition found in clinical cases of postthyroidectomy exophthalmos.¹²

The width of the palpebral fissure of the animals of the three groups varied greatly, depending upon the operative treatment or injections. Extirpation of both the cervical sympathetic ganglia or of Müller's muscle produced a nar-

rowed fissure, whereas exophthalmos was accompanied by a widened one. In an attempt to express these changes quantitatively it was found that, although the differences were small, repeated measurements agreed remarkably well. Measurements were made with a vernier caliper at the same time each day and under constant illumination. Measurements on individual animals were repeated each day until several consistent consecutive values were obtained, both before and after in-

relaxation of the smooth-muscle fibers of the lids.

Production of exophthalmos by anterior-pituitary-extract injections caused a widening of the palpebral fissures in all three groups which, relative to their original width, was of about the same degree in each. In group I the proportional widening of the lid fissure was the same in both eyes although one was normal and the other lacked Müller's orbital muscle. In the eyes lacking sympathetic innerva-

TABLE 2

THE EFFECT OF ANTERIOR-PITUITARY-EXTRACT INJECTIONS ON THE AVERAGE WIDTH OF THE PALPEBRAL FISSURE OF GUINEA PIGS IN (1) NORMALS, FOLLOWING REMOVAL OF (2) THE CERVICAL SYMPATHETIC GANGLIA (3) MÜLLER'S ORBITAL MUSCLE OR (4) BOTH MÜLLER'S MUSCLE AND THE CERVICAL SYMPATHETIC GANGLION

	Right Eye		Left Eye	
	Müller's Orbital Muscle Removed		Orbit Intact	
	Before Injections	After Injections	Before Injections	After Injections
Group I. Cervical Sympathetic Ganglia Intact				
7 cases	6.00 mm.	6.7 mm.	7.7 mm.	8.6 mm.
Min.-Max.	5.6-6.5 mm.	6.3-7.5 mm.	7.0-8.3 mm.	8.3-9.0 mm.
Group II. Right Cervical Sympathetic Ganglion Removed				
11 cases	4.8 mm.	5.8 mm.	7.8 mm.	8.7 mm.
Min.-Max.	4.0-5.7 mm.	4.5-7.5 mm.	7.0-8.5 mm.	7.5-9.5 mm.
Group III. Both Cervical Sympathetic Ganglia Removed				
8 cases.	5.1 mm.	5.6 mm.	5.7 mm.	6.8 mm.
Min.-Max.	4.0-6.2 mm.	5.0-6.5 mm.	4.8-6.9 mm.	6.0-7.6 mm.

jection of the anterior-pituitary extract. The increase in width of the palpebral fissure during the experimental periods represents the changes induced by the extract and those caused by growth during a period of 45 days. Extirpation of the cervical sympathetic ganglia reduced the palpebral fissure from the normal 7.7 to 8.0 mm. (fig. 2) to an average of 5.7 mm. (fig. 4), table 2. Removal of Müller's orbital muscle from a normally innervated orbit decreased the palpebral fissure to about the same extent, 6.0 mm. (fig. 3). If, however, both the muscle and ganglion were taken out the space between the lids became still less (4.8 to 5.1 mm., fig. 5), presumably due to

tion a similar increase in palpebral-fissure width took place in the eyes in both series (those operated on and those unoperated on). In these instances the increase was even greater, relatively, than that occurring in normally innervated eyes.

DISCUSSION

Two methods have been suggested by which the action of Müller's orbital muscle might cause exophthalmos. One concept suggests that the contraction of the muscle fibers might check the flow of venous blood from the orbit and that this stasis might eventually lead to an edema of orbital structures.²¹ The many intercommunicating channels by which the or-

bit could be drained and their distance from Müller's orbital muscle argue against this concept when applied to the human (Hesser²³). In connection with the present experiments the jugular veins of several guinea pigs were injected with a warm carmine-gelatin mass. With this aid the veins of the head were clearly demonstrated in dissections. The pattern of the major venous channels of the face and orbit in the guinea pig was found to be identical with that in man. These channels anastomose freely and, excepting those draining into the cavernous sinus, are not involved with the sheet of smooth muscle. Even if all venous drainage through the posterior part of the orbit should be stopped, there are sufficient accessory channels to care for the orbit properly.

The data supplied by the present experiments finally dispose of this idea because the orbital-tissue changes occur after surgical removal of Müller's muscle. It does not seem probable, therefore, that this type of experimental exophthalmos in guinea pigs is caused by the action of Müller's muscle on the venous drainage channels.

The second, and more frequently considered, means by which Müller's muscle might act is by creating sufficient pressure on the retrobulbar tissue to push the globe outward. This is indeed possible, to some degree, but the persistence of exophthalmos *post mortem* and in the absence of Müller's muscle removes that possibility in these experiments.

The arguments against the importance of Müller's orbital muscle in clinical and experimental exophthalmos reported here do not indicate that the sympathetic nerves and smooth muscles of the eye are not involved in some cases of both clinical and experimental exophthalmos. It seems likely that in those clinical cases associated with hyperthyroidism, in which a heightened activity of the sympathetic

nerves exists, contraction of the smooth muscles of the lids certainly would contribute to the appearance of exophthalmos by a widening of the palpebral fissure. Whether the action of such muscles could have any effect on the proptosis of the globe in humans has not been demonstrated. Certainly the experimental exophthalmos reported by Marine *et al.*, Code and Essex, Cannon and others, is of this functional type, brought about by sympathetic stimulation and action of both Müller's orbital and the palpebral muscles.

Extirpation of the cervical sympathetic ganglia in clinical cases of exophthalmos has not generally led to a decrease in the protrusion. A similar situation was found in the present experiments when removal of these ganglia on one or both sides, with or without the orbital muscle, had no effect on the hypertrophy of orbital tissue or on the exophthalmos *post mortem*. Therefore, it seems clear that the active constituent of the pituitary extract does not act through the cervical sympathetics, on the sympathetic receptive substance, or on the smooth-muscle cells.

The apparent degree of exophthalmos is largely controlled by the position of the lids in guinea pigs. This is clearly shown by measurements of the palpebral fissures. In all these groups of experimental animals a marked ptosis had been produced by the removal of either Müller's muscle or the cervical sympathetic ganglia, or both, at the beginning of the experiment. Although these fissures widened as the injections were given, the ptosis concealed the protrusion of the globe to a large extent. In animals with a ptosis careful examination was necessary in order to decide if there was a real proptosis or not, yet at autopsy the exophthalmos was found to be definite, and the orbital contents were almost equally hypertrophied in all groups.

In these experiments removal of the

floor of the orbit (Müller's muscle) achieved a form of orbital decompression by giving the retrobulbar tissues a slightly greater space into which they could expand. This condition decreased the degree of protrusion to a slight extent, but the amount of orbital tissue was not decreased nor was the edematous infiltration prevented. Furthermore the operative procedure stimulated the growth of connective tissue to a marked degree.

In general one may conclude from the foregoing experiments that the tissue hypertrophy, edematous infiltration, and exophthalmos (demonstrated *post mortem*) produced in this manner is independent of sympathetic innervation through the cervical ganglia and of Müller's orbital muscle. In these characteristics this type of exophthalmos is similar to postthyroidectomy, progressive, or malignant exophthalmos in man.

CONCLUSIONS

1. The hypertrophy and pathological modification of the retrobulbar tissue

found in exophthalmos produced by injection of anterior-pituitary extract into thyroidectomized guinea pigs is independent of Müller's orbital muscle.

2. These changes are unaffected by unilateral or bilateral extirpation of the cervical sympathetic ganglia.

3. The ptosis created by sectioning the cervical sympathetic ganglia or removing Müller's muscle decreases the apparent degree of exophthalmos.

4. Exophthalmos produced as described, and judged *post mortem* after removal of the skin and lids, is not dependent either upon Müller's orbital muscle or sympathetic innervation through the cervical ganglia.

5. Orbital decompression, as achieved in these experiments, does not relieve the condition of the orbital tissues, but slightly decreases the degree of proptosis.

I wish to express my appreciation to Miss Victoria Ozanics for her able assistance throughout this study.

630 West One Hundred
Sixty-eighth Street.

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THE ROLE OF BRUCELLA IN HUMAN AND ANIMAL OCULAR DISEASE WITH SPECIAL REFERENCE TO PERIODIC OPHTHALMIA IN HORSES*

EARL L. BURKY, M.D., ROBERT REDVERS THOMPSON, PH.D.,
AND HELEN M. ZEPP, A.B.
Baltimore, Maryland

Periodic ophthalmia or "moonblindness" in horses is a recurring uveitis which usually leads to complete loss of vision through cataract formation or massive detachment of the retina. The etiology is obscure. However, certain recent, personal clinical and experimental observations suggest that the disease may be a manifestation of Brucellosis. Although a considerable body of information relative to *Brucella* infections has been assembled, the suggestion that periodic ophthalmia is a form of this disease, to our knowledge, is apparently new, and it is the purpose of this report to present such information as is pertinent to this hypothesis and also to discuss briefly the relation of these findings to human ophthalmological problems.

Brucella infections derive their name from David Bruce,¹ an English army physician who, in 1887, isolated a small gram-negative, coccoid bacillus from patients with Malta or Mediterranean fever. In 1897, Bang² recovered the organism from cows that aborted their young. In 1913, Traum³ grew it from sows that had aborted. Human infection due to this organism was rarely recorded in this country until 1918, when Evans⁴ suggested that the Bang type might be pathogenic for man. Since that time a steadily increasing number of infections in humans has been reported each year. Because of the increasing interest in the disease and

the increasing confusion in terminology the proposal has been made and generally accepted that strains of this organism from any source be given the generic name of *Brucella* in honor of the man who first isolated the organism.

In horses, the organism has been recovered from rare cases of abortion and more commonly from a clinical condition known as fistulous withers or poll evil. In animals with this disease a fluctuant swelling develops at the site of some physical trauma such as about the shoulders following the use of poorly fitting collars. Ultimately, the abscess breaks down or is opened, and a chronic draining sinus is established. *Brucella* has been recovered in pure culture from such abscesses before rupture. Although it is commonly considered to be the cause of the condition, experimental inoculation has never directly reproduced the disease.

The study was undertaken for several reasons. First, the disease is of tremendous economic importance to the breeder and user of horses, and our interest was aroused by the owners of afflicted horses who asked for some therapeutic help; second, because periodic ophthalmia in horses resembles recurring uveitis in humans, the etiology of which is frequently obscure. This resemblance suggested that a study of the natural disease in the horse might yield information applicable to the human problem.

Periodic ophthalmia is a disease that is probably as old as the domesticated horse, but its recorded history is scanty, inaccurate, and colored with superstition.

* From the Wilmer Institute of Ophthalmology, Johns Hopkins University.

Presented before the Association for Research in Ophthalmology, Saint Louis, May 16, 1939.

This rather sweeping and condemnatory statement is based on 12 years of observation (E. L. B.), during which time it was found that most of the recorded facts and popular ideas could not be substantiated. Therefore, a review of the early literature would only be time-consuming. It can be summarized, however, by saying that the disease has been attributed to food, climate, elevation above sea level, miasms, filth, and parasites of one kind or another. More recently, in 1927, Rosenow⁵ reported that *Flavobacterium ophthalmiae* was the cause of the disease. This was denied by Woods and Burky⁶ in 1929. In the same year Woods and Chesney⁷ announced that a filterable agent from the diseased eye, when injected into the vitreous of healthy horse eyes, produced a recurring uveitis that resembled periodic ophthalmia. The other eye, however, was never affected, and it was not shown that the disease could be transmitted by any other form of inoculation. Dimock⁸ and his associates have been unable to confirm the findings of Woods and Chesney.

The disease occurs at any age except in the suckling foal, although the mother may have several attacks during lactation. It is the impression of one of us (E. L. B.) that the disease is much more common in females and geldings than in stallions. The ocular inflammation develops in an apparently normal eye within 24 to 48 hours, at which time the lids are markedly injected and edematous, with greatly increased lacrimation. Photophobia and lid spasm are so marked that examination may be almost impossible unless the animal is restrained. The cornea is hazy, and after a few days there is a marked vascular infiltration extending two to five millimeters from the limbus. The iris pattern is hazy, the pupil is small. The aqueous ray is so strongly positive that a fundus examination is often impossible. After

a few days hypopyon develops. The fundus is usually obscured by a vitreous haze. In most animals the individual attack runs its course in 10 to 20 days, and during the early remissions between attacks the affected eye appears normal. Later, after repeated attacks, pigment deposits on the anterior lens capsule, posterior synechiae, lens opacities or complete cataracts are found. The attacks occur at irregular intervals and may shift to the opposite eye, or both eyes may be involved at the same time. Occasionally, early in the disease, detachment of the retina occurs. Curiously enough, such eyes have few recurrences. Histologically, the eyes show the usual picture of a chronic uveitis, the only peculiar finding being nodules of lymphocytes. It is not clear whether these are pathognomonic, for little is known about equine ocular reactions to disease.

Early in 1938 a two-year-old filly was seen with a typical periodic ophthalmia in the right eye. It was her third attack. While the ocular examination was in progress she had a profuse, yellow, mucoid discharge from the vagina or urethra, and it was a chance remark by the trainer concerning this discharge that led to these studies. In essence, the trainer reported that this filly had such a discharge whenever she came into heat, that the heat was prolonged for 10 to 15 days over the normal four or five, and that coincidentally the eye became inflamed. The animal was observed later in a subsequent attack with all of the above signs. It was then learned, although erroneously,* that the mare has as many heat periods as there are lunar cycles. This observation, in connection with the lay term "moon blindness," suggested that there might be some etiological relation-

*Twenty-one days is thought to be the cycle.

ship between the menstrual cycle and the ophthalmia. Examination of the animal by two veterinarians disclosed that she had a cystic ovary. However, the veterinarians disagreed on the significance of this finding. This animal was unfortunately not available for further study. In passing, it may be mentioned that cystic ovaries in the mare are not uncommon, and they are often artificially ruptured in animals that persistently fail to conceive. Pregnancy occurs often enough in such animals to justify the practice.

The owner of this animal* placed at our disposal two mares, aged 15 and 17 years, which developed periodic ophthalmia early in 1938 while the above-mentioned filly was under observation. Both of these developed the disease shortly after parturition, but the foals were normal and healthy. With the idea in mind that some etiological relationship existed between the genital tract and the ophthalmia, various studies were undertaken to establish an etiological agent in the ovaries or genital tract. There was one positive finding. Both animals had agglutinins for *Brucella* in serum dilutions as high as 1:320.

After the presence of agglutinins had been determined in the two animals above mentioned, one of them, Columbia II, was destroyed after she had weaned her foal. The postmortem examination was done under rather difficult conditions and was necessarily incomplete. However, a large cystic ovary was found, and from its contents and from the milk a strain of *Brucella* was isolated.

Shortly thereafter a blind gelding was destroyed. This animal had abscesses in the kidneys. Smears from the mucopurulent contents suggested the presence of *Brucella*, but cultures were negative.

*We are greatly indebted to Major G. L. Stryker for his material assistance and cooperation in this study.

The third animal was a three-year-old filly with bilateral retinal detachment. Other than that she had gone blind as a two-year-old, nothing was known of her history. She was destroyed by shooting. The postmortem examination showed cystic ovaries and a spleen that weighed 22 pounds. A strain of *Brucella* was recovered from the ovaries. The serum contained no agglutinins.

In February, the second mare, Prodigious, with the agglutinins for *Brucella*, foaled a healthy colt. A specimen of milk obtained two days after delivery showed numerous *Brucella* organisms.

The bacteriological isolation of organisms from other equine sources was interrupted by the death of Dr. Thompson, on February 21, 1939. Since that time the investigation has been continued by one of us (E. L. B.) following Dr. Thompson's technique with at first indifferent success. Two autopsies on affected horses were done without our finding any characteristic gross pathology and without isolating the organism.

Recently, however, a completely blind mare was destroyed. At autopsy there were found cystic ovaries, a slightly large and friable spleen, and a liver studded with tuberclelike nodules. A strain of *Brucella* was recovered from the cystic fluid and the blood. The serum did not contain any *Brucella* agglutinins, but the opsonocytophagic test on the whole blood was strongly positive.

In addition to these definite findings other suggestive but not conclusive observations have been made. First, one mare has been under observation through a number of attacks. Between attacks the animal has serum agglutinins present in dilution as high as 1:20. Shortly after the eye becomes involved in a recurrence the titer rises as high as 1:80.

Second, a farmer in Baltimore County brought two pregnant sows to his farm

from Pennsylvania, in 1938. Both aborted their young, and from a foetus, *Brucella* was recovered by the laboratories of the Maryland State Department of Agriculture. These same laboratories then examined the blood cells of all the animals on this farm without finding any *Brucella* agglutinins. Shortly thereafter, a mare developed her first attack of ophthalmia. She was first seen early this year after her third attack, and at that time the eyes were normal. Serum agglutinins were present in dilutions of 1:50. Two days after this examination the animal had a recurrence in both eyes. The agglutinins rose to 1:100.

This animal presented a clinical picture that does not seem to have been generally noted in periodic ophthalmia. At the time of the first examination, when the eyes were normal, the animal held its head high, did a good deal of prancing about, and was difficult to examine because of what might be termed "general good spirits." Two days later, after the ocular onset, the animal was dejected and listless, refused food and water, and was easily restrained for examination. The temperature had risen to 101°F. from 99°F. As the eyes cleared the temperature returned to 99°F. Other animals with periodic ophthalmia were then examined and similar temperature rises, suggestive of those seen in human *Brucellosis*, were observed. It is our impression that the majority of horses with inflamed eyes show evidence of a systemic as well as a local infection in the eyes.

Third, the following suggestive information was obtained on a farm, near Indianapolis, which raises hogs, cows, and Percheron horses. Periodic ophthalmia appeared in 12 mares out of a fluctuating population of about 70. These animals were pastured in a field that was watered by a stream which ran through a field occupied by a herd of hogs known to be

infected with *Brucella*. It is interesting that not one of the 10 stallions has had any ocular disease. These are isolated, each with his own exercise yard, and the water supply is derived from an artesian well supply system.

LABORATORY STUDIES

Materials and methods. In the foregoing observations various tests have been mentioned. Time will not permit a detailed description of these. Moreover, it is unnecessary because we have followed, with minor variations, procedures that are amply described by Huddleson⁹ and others.

The strain recovered from Columbia II has been used to inoculate 30 rabbits and 12 guinea pigs. All inoculations were done with 24- or 48-hour hormone broth cultures. This is the only strain that has been used for inoculation purposes in this laboratory. Intraocular injections were done by introducing the material into the anterior chamber through a 25-gauge needle with the animal under cocaine anesthesia.

Experimental. Whole-broth culture was introduced into the anterior chamber of the right eyes and broth-culture filtrate (Berkefeld V) into the left eyes of six rabbits. Cultures of this filtrate showed that the organism passed the filter. All of the rabbits developed an early keratoiritis with conjunctivitis. Thereafter the clinical course was extremely variable. One animal had a rather severe early reaction in the right eye, with little in the left. Later on the left eye developed a marked inflammation while the opposite eye slowly healed. Two rabbits recovered without any permanent damage, except for slight pigment deposits on the anterior capsule. In the three remaining rabbits the left eye showed little early reaction and healed without permanent change. The right

eyes developed caseous corneas with coincident iritic involvement. One of these corneas has remained caseous for five months while the others have only corneal opacities at the end of this time.

Eighteen rabbits have been injected in the right eye with whole culture. The same varying results were obtained. After three or four months some corneas were completely caseous, others healed with scar formation. Other eyes showed a low-grade iritis and closely resembled the clinical picture in horses. One animal developed a recurring keratitis in the opposite eye. Another rabbit, in which the anterior ocular lesions healed, showed an atrophic choroiditis.

Six rabbits were treated in the following way: Jequirity extract was instilled in the right conjunctival sac. This substance produces in the normal rabbit a kerato-conjunctivitis that clears up with no sequelae in about 10 days. One day after the instillation, 1 c.c. of a 24-hour broth culture was injected intravenously. Two of these rabbits developed a kerato-conjunctivitis that persisted for more than six weeks until the death of one animal. The lesion in the remaining rabbit still persists. Two other rabbits developed a latticelike keratitis, associated with chalazionlike nodules in the conjunctivas. Ocular lesions did not develop in the two remaining rabbits although one died with definite *Brucella* lesions throughout the viscera. Several corneal opacities suggesting nummular keratitis have been seen.

Twelve guinea pigs were injected intraperitoneally or subcutaneously with broth culture. Each animal received 1 c.c. Three died within the month. The other nine were alive more than four months after inoculation and except for a possible weight loss seemed in good condition. Five of the 12 developed corneal opacities. One developed a kerato-

iritis that persisted for about two months, leaving a slightly hazy cornea, an irregular pupil, and posterior synechiae. Except for the absence of any gross lens opacities the eye is typical of those seen in horses after numerous attacks. Another pig developed, three months after inoculation, a unilateral kerato-iritis and conjunctivitis followed by an involvement of the second eye within a few days. Similar results were obtained by Fabian¹⁰ in 1912.

Of the 30 rabbits and 12 guinea pigs thus far infected, five rabbits and three pigs have died. Without exception these deaths have all occurred within 24 or 48 hours after the intracutaneous injection of *Brucella* filtrates. These injections were done to check the diagnostic value of cutaneous reactivity. Whether these deaths were due to a tuberculinlike sensitivity or to chance cannot be determined at this point.

From these results it is evident that the lesions produced in the eyes were extremely variable, nor can they be predicted. In this, the experimental lesions compare with those observed in man and other animals.

All of the experimental animals have been examined for agglutinins, opsonophagocytic indices and were found to be strongly positive. All showed cutaneous reactions to *Brucella* filtrates in varying degrees. The most positive reactions were found in animals with active ocular processes. In occasional animals, ocular lesions became more active following the cutaneous injections.

Postmortem examinations have shown a varying pathology. In some there were no gross lesions while in others the spleen was enlarged and studded with tuberclelike nodules. The picture in the liver varied. One rabbit showed a textbook picture of tularemia with the liver studded with nodules. The kidneys occa-

sionally showed the same nodules. Pneumonia was found, but this may have been due to secondary infection.

Little mention can be made of the histological picture in the eyes at this time, because it was thought not advisable to kill any of this small group with such a great diversity of clinical findings. Such eyes as have been examined do not present the histological picture of periodic ophthalmia.

COMMENT

The foregoing observations and experimental results show clearly that horses harbor bacteria of the *Brucella* group and that these organisms can cause ocular pathology in rabbits and guinea pigs. They do not prove, however, that periodic ophthalmia in horses is due to this organism, although the suggestion cannot be easily dismissed. Several obvious questions must be answered and the disease must be reproduced in horses by inoculation before any definite conclusions can be reached. However, with the above results and with what is already known about the disease in horses and other species some of the questions can be answered and an experimental approach can be planned.

Why have previous studies failed to disclose the presence of this organism? First, the organism is extremely difficult to grow from the infected animal and requires special media and technique and longer periods of incubation than are commonly used. The validity of many previous studies can be questioned on this point alone. Second, the organism is extremely difficult to recognize in histological preparations, so that its presence or absence could not be determined in stained sections of eyes. Third, the majority, if not all, of previous investigators have sought to recover and recognize the infectious agent in the diseased eye. That this recognition is a theoretical possibility

there can be no doubt. In practice, however, it is almost an impossibility. Horses are expensive animals and owners are extremely loath to sacrifice animals without good cash returns before the recurrences and loss of vision have established the clinical diagnosis. Once this has occurred it becomes increasingly difficult to recognize the onset of a recurrence, and it is more than a probability that the organisms disappear rapidly from the eye after they have initiated an attack. Consequently, unless the eye is cultured early in an attack it is probable that nothing will be cultivated.

Has the disease been reproduced in horses? As yet no attempts have been made for a number of reasons. First, the experiments in rabbits and guinea pigs have shown that the ocular lesions vary with different animals. This observation, coupled with the distribution of the disease in horses, suggests that any well-planned experiment would include a large number of animals. For financial reasons alone such an experiment could not be undertaken at present.

It was mentioned earlier that although fistula of the withers is commonly thought to be due to *Brucella*, experimental inoculations have not reproduced the disease. This again suggests that some unknown factor must be under control before any experimental studies are undertaken.

Recent developments in the prevention of Bang's disease or infectious abortion in cattle suggest such a factor. Practical cattlemen have known and recent formal experiments in California have shown that the offspring of infected mothers, if they are born alive and healthy, are apparently immune to the disease and do not abort their young in adult life. While the explanation of this immunity is not definitely understood it seems likely that the ingestion of infected milk is a form of vaccination that is relatively harmless

to the newborn animal. If the same phenomenon should occur in horses it is obvious that the injection of animals, born of infected mothers, would be futile and only lead to false conclusions. Furthermore, it is just such animals that are likely to be available for experimental purposes because of the popular idea that the disease is hereditary and the young of infected mothers, consequently, can be bought more cheaply.

The idea that the disease is hereditary is open to question. Personal observations (E. L. B.), on the contrary, suggest that the opposite is true, that the young of infected mothers are immune. At the moment this impression is not open to statistical confirmation because no reliable figures are available. This much can be said, however: First, suckling foals do not develop the disease, and second, to the present time we have been unable to find an animal that has developed the disease in adult life after it has suckled an infected mother. If this latter impression can be confirmed, it may lead to a practical method of control even though *Brucella* is not proved to be the cause of the disease.

Why is it that cattle known to be infected do not develop eye trouble? The easiest and most obvious answer to this question is that a difference in species reactivity is responsible. For example, two of the animals we have examined have been good brood mares and did not abort their foals, although they were definitely infected, whereas a cow with a similar infection would certainly have aborted at least one calf. However, certain indirect evidence exists that the eyes of cows are occasionally attacked by this organism, although in a somewhat different clinical form. DeSchweinitz¹¹ reported on papilledema and optic atrophy in Guernsey bulls. The histological evidence suggested that the lesions were due to a chronic

blood-borne infection with some of the reactions of Bang's disease. One of the dairymen who owned some of the animals seen by deSchweinitz told E. L. B. that the blind ones had Bang's disease, that blindness is one of the stigmata in calves from infected mothers, and that the elimination of infected mothers eliminated the blindness in the herd.

These studies in the horse were undertaken in complete ignorance of the fact that ocular signs had been described in man and animals infected with *Brucella*. After our first experimental results had been obtained, the papers by Reed and Goldfain,¹² Green,¹³ and McGinty and Gambrell¹⁴ appeared, and suspicions that this species might cause human ocular reactions became more definite. This led to the study of the serological reactions to *Brucella* of individuals with uveal-tract and corneal inflammations in whom the etiological factor was obscure.

It was our intention, when this report was planned, to present the rather suggestive findings obtained in humans. However, the time limits imposed by this Society prevent adequate presentation and the human findings will be made the subject of a future report.

SUMMARY

Brucella (species undetermined) has been recovered at necropsy from the ovaries and milk of three mares sacrificed because of blindness due to clinical periodic ophthalmia. A fourth strain has been recovered from the milk of a mare with a similar ocular condition.

When injected into the anterior chamber of rabbits or intravenously into rabbits and guinea pigs, the first strain that was recovered produced in some but not all animals ocular inflammation resembling periodic ophthalmia in horses and chronic recurrent intraocular inflammation in humans.

It is suggested that, because of the experimental results and clinical observations made in the field, infection with *Brucella* may be the cause, or one of the causes, of periodic ophthalmia. In addi-

tion, the experimental results, coupled with clinical observations on humans already reported in the literature, suggest that this infection may play an important role in human ocular pathology.

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DISCUSSION

DR. CLYDE A. CLAPP (Baltimore, Md.): I think probably Dr. Burky has told most of the details. It was a case of uveitis starting first in the left eye, followed in about six months by recurrence in the right eye. In spite of various diagnoses and in spite of anti-syphilitic treatment and in spite of tuberculin treatment, the eyes have gradually gone bad, vision entirely gone in the left eye and down to 2/200 in the right eye.

As Dr. Burky said, there have been various diagnoses on these eyes, and we are in hopes at the present time that the proper diagnosis has been made.

DR. JOHN GREEN (St. Louis, Mo.): The reason I speak is that I have a rather striking case which has still not been reported, which seems to indicate that the *Brucella* organism may be the cause of choroiditis, resembling clinically tuberculous choroiditis.

EXPERIMENTAL PRODUCTION OF CONJUNCTIVITIS WITH STAPHYLOCOCCI*

JAMES H. ALLEN, M.D.
Iowa City

Conjunctivitis has been produced in rabbits by several workers¹ using staphylococcus filtrates or toxin; however, the results with living staphylococci have not been so successful. Keratitis has been reported following the intracorneal inoculation of staphylococci and Strumia and Scarlett² have produced a keratoconjunctivitis by the intracorneal inoculation of staphylococci in rabbits previously sensitized by heat-killed organisms according to the technique of Julianelle.³ However, conjunctival inoculations alone have failed.

The instillation of staphylococcus toxin upon the human conjunctiva likewise has resulted in a conjunctivitis, but there have been no extensive studies made with living staphylococci. McKee⁴ reported the production of conjunctivitis in man by the instillation of staphylococcus cultures but gave no details.

Therefore this study was made in an effort to determine some of the factors entering into the production of conjunctivitis with staphylococci.

METHODS AND MATERIALS

Strains of *Staphylococcus aureus* used throughout the experiments were isolated from cases of conjunctivitis or keratoconjunctivitis. Each produced hemolysis upon blood-agar plates, fermented mannitol, liquefied gelatin, caused coagulation of citrated human plasma, and produced a potent exotoxin. Strain "B" was isolated

from an acute conjunctivitis of a 6-day-old infant. Strain "M" was isolated from an adult with an acute ulcerative keratitis and conjunctivitis that had developed as an exacerbation of a chronic conjunctivitis. The strain of *Staphylococcus albus* used as a control was nonhemolytic, did not produce a measurable amount of exotoxin, did not ferment mannitol, and did not liquefy gelatin. It was isolated from the normal conjunctiva of a pre-operative cataract patient who had no postoperative infection.

In one series of rabbit inoculations and in one series of human inoculations, cultures were used that had been grown in nutrient broth for 18 hours at 37°C. In all other series the organisms were grown in nutrient broth for 3 hours. The medium was inoculated, placed in a 37°C. water bath, and shaken every 15 minutes.

Inoculations were made into the mouths of the meibomian glands of one series of rabbits. For this purpose a sterile Pasteur pipette was drawn out to capillary diameter, the tip broken off and a small amount of inoculum drawn into the pipette. Rabbits anesthetized by intravenous nembutal were placed under a dissecting microscope, the tip of the pipette was inserted into the mouth of a meibomian gland of the lower lid, and a small amount of the inoculum injected into the gland.

Anitoxin determinations were made by the hemolytic method,⁵ and were controlled by standard toxin and antitoxin kindly furnished by the National Institute of Health.

RABBIT EXPERIMENTS

White rabbits weighing between 3 and

* From the Department of Ophthalmology, State University of Iowa, College of Medicine. Part of a study being conducted under a grant from the John and Mary R. Markle Foundation. Read before the Association for Research in Ophthalmology in Saint Louis, May 16, 1939.

TABLE 1
RABBIT: SERIES I

INOCULUM: O.D., 18-HOUR BROTH CULTURE OF STAPHYLOCOCCUS AUREUS; O.S., NO INOCULATION

No. of Rabbits	Condition of Conjunctiva	Method of Inoculation	Result	Staph. aureus Cultured from O.D.	Antitoxin per c.c. Serum
12	Normal	Instillation	No conjunctivitis	3-5 days	0
12	Abraded	Instillation	Traumatic reaction 24 hours' duration	3-5 days	0
12	Normal	Instillation of organisms suspended in toxin	Toxic reaction of 24 hours' duration	3-5 days	0

5 pounds were selected for the experiments, after examination revealed normal conjunctivae and cultures showed no pathogenic bacteria. In addition the serum of each rabbit was titrated and only those without demonstrable antitoxin were used.

Series I

Inoculations were made in 36 rabbits by the instillation of an 18-hour broth culture of *Staphylococcus aureus* into the conjunctiva of the right eye (table 1). The left eye served as a control in each case. In the first group of 12 rabbits the instillation was made upon the normal conjunctiva. Cultures were taken from both eyes each day for one week following the instillation. *Staphylococcus aureus* was grown from the right eye for 3 to 5 days, but there was no evidence of conjunctival irritation nor discharge. *Staphylococcus aureus* was not grown from the left (control) eye.

In the second group of 12 rabbits the

cocainized conjunctiva of the right eye was abraded with a sterile platinum spatula before the instillation was made. Following this method of inoculation the conjunctiva was red and congested for approximately 24 hours. There was a slight amount of purulent discharge on the lid margin the morning after inoculation, but both the redness and discharge were absent after 30 to 36 hours. Cultures of the right eye grew *Staphylococcus aureus* for 3 to 5 days, but the uninoculated left eye remained free from these organisms.

In the third group of 12 rabbits the organisms were suspended in toxin and then instilled into the conjunctiva of the right eye. The 18-hour broth culture was centrifuged, the supernatant broth removed, and the organisms resuspended in toxin. In approximately 6 hours conjunctival injection developed, increased for several hours, and disappeared in from 18 to 24 hours after the inoculation. A slight purulent exudate accompanied the

TABLE 2
RABBIT: SERIES II

INOCULUM: O.D., 3-HOUR BROTH CULTURE; O.S., NO INOCULATION

No. of Rabbits	Condition of Conjunctiva	Method of Inoculation	Result	Staph. aureus Cultured from O.D.	Antitoxin per c.c. Serum
6	Normal	Instillation	No conjunctivitis	3-5 days	0
6	Abraded	Instillation	Traumatic reaction	3-5 days	0

redness and disappeared with it. Conjunctival cultures revealed *Staphylococcus aureus* in the right eye for 3 to 5 days, but no colonies of this organism were grown from the left eye.

Series II

Inoculations were made in 12 rabbits by the instillation of a 3-hour broth culture into the right conjunctival sac (table 2). In 6 the instillation was made upon the normal conjunctiva, and in 6 the instillation was made upon the abraded conjunctiva. The results were comparable to those from the inoculations in series I.

Series III

Inoculations were made into the meibomian glands of the left lower lids of 30 rabbits. In each case the right eye served as an uninoculated control.

The first group of 12 rabbits was inoculated with a 3-hour broth culture of *Staphylococcus aureus*. An acute infection of the meibomian gland and an acute conjunctivitis developed in approximately 12 to 18 hours. These infections reached their height in 48 hours (fig. 1), persisted for 2 to 3 weeks, then gradually subsided into a chronic meibomitis and conjunctivitis that lasted for 6 to 8 months. Cultures taken during the acute infection grew many colonies of *Staphylococcus aureus*. After the acute infection subsided cultures were taken at weekly intervals, and during the first month *Staphylococcus aureus* was grown in each culture. However, the number of colonies gradually diminished, and after two months *Staphylococcus aureus* could be cultured only from material expressed from the meibomian glands.

In a control group of 12 rabbits the inoculum was a 3-hour broth culture of *Staphylococcus albus*. In these animals an acute meibomian infection developed in approximately 12 to 18 hours, reached

its height in 24 to 36 hours, and began to subside in 48 to 60 hours (fig. 2). Many colonies of *Staphylococcus albus* were obtained upon culture 24 hours after the inoculations, but the number diminished rapidly and the cultures from the two eyes were comparable again after 4 to 5 days.

A second control group consisted of 6 rabbits immunized by repeated intravenous injections of a potent toxoid.* Serum titers ranged from 40 to 60 units of anti-toxin, one had 40 units, two had 44 units, one had 52 units, one 55 units, and one 60 units per cubic centimeter. The meibomian glands of these rabbits were inoculated with a 3-hour broth culture of *Staphylococcus aureus*. An acute localized infection of the meibomian gland developed and subsided in 48 to 72 hours. Cultures of *Staphylococcus aureus* were obtained from the conjunctiva of the left eye for 4 or 5 consecutive days after the inoculation.

HUMAN INOCULATIONS

A series of human inoculations was considered only after the essayist had inoculated his own conjunctiva with larger numbers of organisms than were used subsequently. His serum titer for anti-toxin was 0.8 unit per cubic centimeter. Strain "B" was massaged upon the left conjunctiva with a platinum loop. Four months later a 3-hour broth culture of strain "M" was instilled upon the right conjunctiva. In each case, after a 24-hour incubation period, a mild acute conjunctivitis developed and subsided spontaneously in the course of one week.

Infants 4 to 6 days old were chosen for the human inoculations for the following reasons: first, and most important, was the fact that the spontaneous disease in infants is of the acute catarrhal type, is

* Kindly furnished by the Lederle Laboratories.

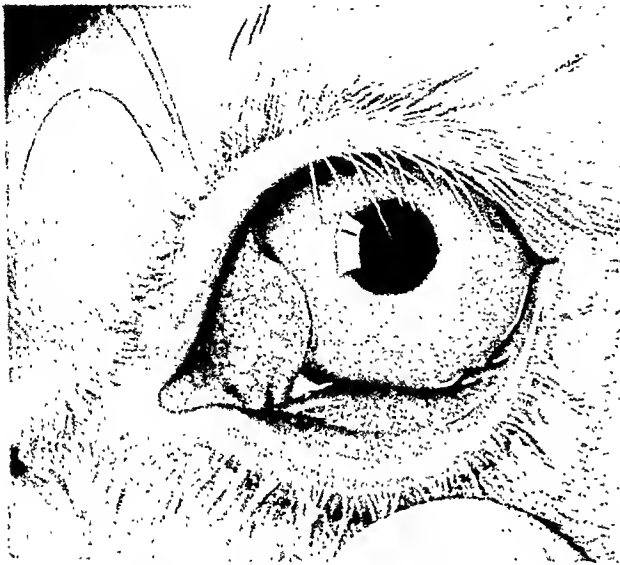


FIG. 1 (ALLEN). RABBIT CONJUNCTIVA 48 HOURS AFTER INTRAMEIBOMIAN INOCULATION WITH A TOXIGENIC STRAIN OF STAPHYLOCOCCUS AUREUS.



FIG. 2 (ALLEN). RABBIT CONJUNCTIVA 48 HOURS AFTER INTRAMEIBOMIAN INOCULATION WITH A NON TOXIGENIC STRAIN OF STAPHYLOCOCCUS ALBUS.



FIG. 3 (ALLEN). ANGULAR EXCORIATION, SLIGHT DISCHARGE, AND HYPEREMIA 60 HOURS AFTER INSTILLATION OF STRAIN "M" ONTO THE NORMAL CONJUNCTIVA.



FIG. 4 (ALLEN). CONJUNCTIVITIS 72 HOURS AFTER INSTILLATION OF STRAIN "M" ONTO THE NORMAL CONJUNCTIVA.

TABLE 3
RABBIT: SERIES III
MEIBOMIAN-GLAND INOCULATIONS, LEFT EYE ONLY

No. of Rabbits	Inoculum (3-hour culture)	Result	Antitoxin per c.c. Serum
12	Staph. aureus (toxigenic)	Acute meib. and conj. 2-3 weeks' dur. Chr. meibomitis 6-8 mos.' duration	0
12	Staph. albus (nontoxigenic)	Meibomitis localized 48-72 hours' dur.	0
6	Staph. aureus (toxigenic)	Meibomitis localized 48-72 hours' dur.	40-60 u.

self-limited, and no serious sequelae are observed; second, variables such as contacts, exposures, and changes in temperature are more readily controlled, as the infants may be fed by bottle and kept in an isolated nursery; and third, the conjunctivae of infants are likely to be more nearly uniform. The individuals were selected on the basis of clinically normal conjunctivae and negative conjunctival cultures.

Series I

One drop of an 18-hour broth culture of *Staphylococcus aureus* (strain "B") was instilled into the right eye of each of five babies (table 4). Although *Staphylococcus aureus* was recovered on culture from these eyes for 4 or 5 days after the inoculation, no evidence of conjunctivitis was observed. In each case the antitoxin level of the serum was less than 0.1 unit.

Series II

A 3-hour broth culture of strain "B"

was centrifuged, the supernatant broth removed, and the organisms resuspended in toxin previously prepared from the same strain. One drop of this suspension was instilled into the right eye of each of six infants (table 5). Conjunctival irritation became manifest by congestion and slight discharge in approximately 6 hours, increased for a few hours, and began to subside in 18 to 20 hours. In two infants the reaction continued to subside and disappeared completely between 24 and 30 hours. However, in four the reaction became more intense between 24 and 30 hours after the inoculation and persisted for 4 to 5 days, at which time local therapy was instituted. Cultures were made daily from both eyes of each baby. Many colonies of *Staphylococcus aureus* were grown each day from the right eyes but the left eyes remained free from this organism. The babies in whom the conjunctival reaction disappeared after 24 hours had an antitoxin titer of 1.0 unit per cubic centimeter of serum, the other

TABLE 4
HUMAN: SERIES I
INOCULUM: O.D., 18-HOUR BROTH CULTURE, STRAIN "B"; O.S., NO INOCULATION

Baby	Age in Days	Condition of Conjunctiva	Culture		Result	Antitoxin per c.c. Serum
			Before Inoculation	After Inoculation		
G. H.	5	Normal	Staph. alb. (NH)	Staph. aureus	No conj.	-0.1 unit
B. S.	5	Normal	No growth	Staph. aureus	No conj.	-0.1 unit
G. R.	4	Normal	Staph. alb. (NH)	Staph. aureus	No conj.	-0.1 unit
C. G.	9	Normal	No growth	Staph. aureus	No conj.	-0.1 unit
G. T.	6	Normal	No growth	Staph. aureus	No conj.	-0.1 unit

(NH) = no hemolysis on blood agar.

TABLE 5
HUMAN: SERIES II

INOCULUM: O.D., 3-HOUR BROTH CULTURE, STRAIN "B", SUSPENDED IN TOXIN; O.S., NO INOCULATION

Baby	Age in Days	Conjunctivitis*	Incubation Period	Culture after Inoculation		Antitoxin per c.c. Serum
				O.D.	O.S.	
G. A. H.	4	+	24 hours	Staph. aureus	0	-0.06 unit
B. B. S.	5	+	24 hours	Staph. aureus	0	-0.06 unit
B. L.	5	0	—	Staph. aureus	0	1.00 unit
B. W.	4	+	24 hours	Staph. aureus	0	-0.06 unit
McF.	5	0	—	Staph. aureus	0	1.00 unit
B. H.	4	+	36 hours	Staph. aureus	0	0.12 unit

* Transient reaction to toxin in each case.

four had less than 0.2 unit per cubic centimeter.

Series III

In six infants one drop of a 3-hour broth culture was instilled upon the abraded conjunctiva of the right eye (table 6). The trauma was made with a sterile platinum spatula in the manner of taking conjunctival scrapings. The left eye was not inoculated. The mild traumatic reaction subsided in 12 to 18 hours in each case. In one baby no other conjunctival signs developed, but in five an acute catarrhal type of conjunctivitis appeared in from 24 to 36 hours and persisted for 4 to 5 days.

Cultures taken daily grew many colonies of Staphylococcus aureus from the right eye of each infant but none from the left eye.

The antitoxin titer of the serum was

0.2 unit or less per cubic centimeter for each of the five babies who developed conjunctivitis but was 0.6 unit per cubic centimeter for the one failing to develop an inflammation.

Series IV

A 3-hour broth culture of Staphylococcus aureus (strain "B") was instilled into the right conjunctival sacs of six infants. The left eyes were not inoculated (table 7). In five of the babies discharge and redness of the right conjunctiva was observed between 48 and 60 hours later. A typical acute conjunctivitis developed and persisted until local therapy was instituted 6 to 7 days after the inoculation. One baby did not develop signs of conjunctivitis. The serum titer in this case was 1.0 unit per cubic centimeter, whereas the sera of the five babies developing conjunctivitis contained 0.2 unit or less.

TABLE 6
HUMAN: SERIES III

INOCULUM: O.D., 3-HOUR BROTH CULTURE, STRAIN "B", ABRADED CONJUNCTIVA; O.S., NO INOCULATION

Baby	Age in Days	Conjunctivitis*	Incubation Period	Culture after Inoculation		Antitoxin per c.c. Serum
				O.D.	O.S.	
P. H.	6	+	24 hours	Staph. aureus	0	-0.1 unit
B. B.	5	+	36 hours	Staph. aureus	0	0.2 unit
G. A. W.	5	+	24 hours	Staph. aureus	0	-0.1 unit
W. I. E.	4	+	30 hours	Staph. aureus	0	0.2 unit
H. O. D.	4	0	—	Staph. aureus	0	0.6 unit
G. R. A.	4	+	30 hours	Staph. aureus	0	0.2 unit

* Traumatic reaction in each case.

TABLE 7
HUMAN: SERIES IV

INOCULUM: O.D., 3-HOUR BROTH CULTURE, STRAIN "B"; O.S. NO INOCULATION

Baby	Age in Days	Conjunctivitis	Incubation Period	Culture after Inoculation		Antitoxin per c.c. Serum
				O.D.	O.S.	
B. A. S.	5	+	48 hours	Staph. aureus	0	-0.1 unit
B. M.	4	0	—	Staph. aureus	0	1.0 unit
B. H.	4	+	48 hours	Staph. aureus	0	-0.2 unit
B. E. L.	5	+	60 hours	Staph. aureus	0	0.2 unit
C. R. A.	4	+	48 hours	Staph. aureus	0	0.15 unit
H. I. N.	4	+	48 hours	Staph. aureus	0	0.15 unit

Cultures made daily, after the inoculation, grew many colonies of *Staphylococcus aureus* from the right eye of each baby.

Series V

A 3-hour broth culture of *Staphylococcus aureus* (strain "M") was centrifuged, the broth removed, and the organisms resuspended in toxin previously prepared from the same strain. One drop of this suspension was instilled into the right eye of each of six infants (table 8). In each case a toxic conjunctivitis developed and subsided in 18 to 20 hours. In four infants no other manifestations of conjunctivitis was observed but in two conjunctival congestion and discharge reappeared approximately 24 hours after the instillation and persisted for 4 to 6 days.

The left eye of each infant of this series was inoculated by the instillation of one

drop of a 3-hour broth culture of strain "M." In four infants no conjunctival irritation nor discharge developed. In two babies redness and discharge appeared between 48 and 60 hours after the inoculation but subsided spontaneously in 4 to 6 days.

Cultures were made daily, and colonies of *Staphylococcus aureus* were grown from each eye for 4 to 5 days. The antitoxin titer of the serum of the two infants who developed conjunctivitis was less than 0.1 unit but the titer of those who did not develop conjunctivitis varied from 1.0 to 10.0 units per cubic centimeter.

Series VI

The conjunctiva of the right eye of each of five infants was abraded with a sterile platinum spatula in the manner of taking a conjunctival scraping. One drop

TABLE 8
HUMAN: SERIES V

INOCULUM: O.D., 3-HOUR BROTH CULTURE, STRAIN "M", SUSPENDED IN TOXIN; O.S., 3-HOUR BROTH CULTURE, STRAIN "M"

Baby	Age in Days	Conjunctivitis		Incubation Period		Culture after Inoculation		Antitoxin per c.c. Serum
		O.D.*	O.S.	O.D.	O.S.	O.D.	O.S.	
G. F.	4	0	0	—	—	Staph. aur.	Staph. aur.	5.0 unit
B. B. B.	5	+	+	24 hours	60 hours	Staph. aur.	Staph. aur.	-0.04 unit
B. G. S.	5	0	0	—	—	Staph. aur.	Staph. aur.	10.0 unit
R. E. B.	6	+	+	24 hours	48 hours	Staph. aur.	Staph. aur.	0.03 unit
K. N. B.	6	0	0	—	—	Staph. aur.	Staph. aur.	1.2 unit
B. L. H.	6	0	0	—	—	Staph. aur.	Staph. aur.	1.0 unit

* Transient reaction to toxin in O.D. of each case.

TABLE 9
HUMAN: SERIES VI

INOCULUM: O.D., 3-HOUR BROTH CULTURE, STRAIN "M", ON ABRADED CONJUNCTIVA; O.S., 3-HOUR BROTH CULTURE, STRAIN "M"

Baby	Age in Days	Conjunctivitis		Incubation Period		Culture after Inoculation		Antitoxin per c.c. Serum
		O.D.	O.S.	O.D.	O.S.	O.D.	O.S.	
B. K.	5	+	+	24 hours	48 hours	Staph. aur.	Staph. aur.	-0.05 unit
B. B. A.	5	+	+	24 hours	48 hours	Staph. aur.	Staph. aur.	-0.05 unit
A. B.	5	+	+	30 hours	60 hours	Staph. aur.	Staph. aur.	-0.05 unit
B. E. A.	5	+	+	30 hours	60 hours	Staph. aur.	Staph. aur.	-0.10 unit
D. E. T.	4	+	+	24 hours	48 hours	Staph. aur.	Staph. aur.	-0.10 unit

of a 3-hour broth culture of strain "M" was instilled into both conjunctival sacs of the babies (table 9). In each case the traumatic reaction subsided in 12 to 18 hours, but conjunctival congestion accompanied by a slight discharge reappeared in the right eyes between 24 to 30 hours after the inoculations. Similar signs appeared in the left eye 24 to 30 hours later; that is, in 48 to 60 hours after the inoculations. The conjunctivitis persisted until controlled by local therapy six days after the inoculations. During this period many colonies of Staphylococcus aureus were grown daily from each eye. The antitoxin titer of the sera of these babies was less than 0.1 unit per cubic centimeter in each case.

Series VII

The right eye of each of six infants was inoculated by the instillation of one

drop of a 3-hour broth culture of Staphylococcus aureus strain "M." The left eye of each was inoculated by the instillation of one drop of a 3-hour broth culture of Staphylococcus albus (table 10). In five cases a conjunctivitis developed in the right eye in from 48 to 60 hours after the instillations (figs. 3 and 4). No evidence of conjunctival inflammation developed in the left eyes, and in one case neither eye developed inflammation. In the latter instance the antitoxin titer of the baby's serum was 1.25 units per cubic centimeter. The titer of the sera of the five who developed conjunctivitis was less than 0.2 unit per cubic centimeter.

SUMMARY AND DISCUSSION

An infectious conjunctivitis was not produced in young rabbits by the instillation of cultures of toxigenic Staphylococcus aureus upon the normal or abraded

TABLE 10
HUMAN: SERIES VII

INOCULUM: O.D., 3-HOUR BROTH CULTURE, STRAIN "M"; O.S., 3-HOUR BROTH CULTURE, STAPH. ALBUS (NONHEMOLYTIC)

Baby	Age in Days	Conjunctivitis		Incubation Period		Culture after Inoculation		Antitoxin per c.c. Serum
		O.D.	O.S.	O.D.	O.S.	O.D.	O.S.	
C. L. S.	5	0	0	—	—	Staph. aur.	Staph. alb.	1.25 unit
H. A. R.	6	+	0	48 hours	—	Staph. aur.	Staph. alb.	-0.10 unit
H. S. K.	5	+	0	60 hours	—	Staph. aur.	Staph. alb.	0.2 unit
H. A. Y.	6	+	0	60 hours	—	Staph. aur.	Staph. alb.	-0.1 unit
S. T. K.	6	+	0	48 hours	—	Staph. aur.	Staph. alb.	-0.1 unit
B. G. C.	5	+	0	48 hours	—	Staph. aur.	Staph. alb.	0.2 unit

conjunctiva nor by the simultaneous instillation of organisms and toxin. However, an acute infectious conjunctivitis was produced in nonimmune rabbits following inoculation of the meibomian glands with a small amount of broth culture of a toxin-producing strain of *Staphylococcus aureus*. Nonimmune control rabbits inoculated in the same manner with a nontoxigenic strain of *Staphylococcus albus* developed a localized meibomian gland infection without conjunctivitis. Control rabbits with a high antitoxin level developed a similar localized meibomian gland infection without conjunctivitis after intrameibomian inoculation with the toxigenic strain of *Staphylococcus aureus*.

As has been shown by previous workers,⁶ the normal or slightly traumatized conjunctiva of the rabbit was resistant to staphylococcus infection. However, with an infection established in the meibomian glands, apparently enough toxin was liberated to permit the production of a conjunctivitis. The proof of this reasoning lies in the abatement of the acute conjunctivitis simultaneously with the acute meibomitis, the failure of the nontoxigenic strains of *Staphylococcus albus* to produce conjunctivitis, and the failure of the toxigenic strain of *Staphylococcus aureus* to produce conjunctivitis in the rabbits with high levels of antitoxin.

In the infants, toxin and antitoxin apparently were the important factors in the production of conjunctivitis with staphylococci. However, the age of the culture played some role, for 18-hour broth cultures failed to produce conjunctivitis even though the babies had less than 0.1 unit of antitoxin per cubic centimeter of serum. With 3-hour cultures toxigenic strains of *Staphylococcus aureus*, conjunctivitis was produced in each case in which the baby had 0.2 unit or less of antitoxin per cubic centimeter of

serum, but conjunctivitis was not produced in infants with more than 0.5 unit of antitoxin per cubic centimeter. Conjunctivitis was not produced in babies with a nontoxigenic strain of *Staphylococcus albus*, even though the antitoxin titer was low.

Conjunctivitis appeared in 48 to 60 hours after the instillation of the culture upon the normal infant conjunctiva but this period was shortened by trauma. Both mechanical and toxic trauma reduced the incubation period to 24 to 30 hours. However, clinical application of these incubation periods should not be made because of the relatively large number of organisms instilled upon the conjunctiva in one drop of culture, perhaps 45 to 50 million.

Each infant was observed until the conjunctiva had returned to normal and cultures failed to grow the inoculated organisms. In a few cases the conjunctivitis subsided spontaneously after 4 to 5 days, in others the conjunctivitis was controlled by local therapy. No complications nor sequelae resulted.

The antitoxin level of the infant's serum was either equal to or slightly below that of its mother.

CONCLUSIONS

1. Toxigenic strains of staphylococci were capable of producing conjunctivitis when instilled onto the normal human conjunctiva.

2. Conjunctivitis did not develop in infants whose antitoxin titer was more than 0.5 unit per cubic centimeter of serum.

3. Trauma, either mechanical or toxic, shortened the incubation period of the experimental conjunctivitis in infants.

4. A nontoxigenic strain of *Staphylococcus albus* did not produce conjunctivitis in infants.

5. Conjunctivitis was not produced in rabbits by instillations of staphylococci

upon the normal or abraded conjunctiva or when instilled simultaneously with toxin.

6. In nonimmune rabbits intrameibomian inoculations of toxigenic strains

of staphylococci produced an acute meibomitis and conjunctivitis of 2 to 3 weeks' duration followed by a chronic meibomitis and conjunctivitis of 6 to 8 months' duration.

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A STUDY OF THE PROFESSIONS TESTING OCULAR REFRACTION*

E. A. THACKER, M.S., M.D.

New Orleans, Louisiana

This investigation has been carried out in an effort to determine and present certain facts concerning the professions of ophthalmology and optometry and to present impartially the results of such investigation.

Technically, an ophthalmologist or oculist is a graduate of a recognized college of medicine who has had special training in diagnosis and treatment of ocular diseases and refractive errors of the eye; an optometrist is one who measures the degree of visual acuity, a refractionist—referring generally to a person without medical training who fits glasses to correct visual defects.

PROCEDURE

The procedure followed in this investigation included the recording of the ocular history, the external examination of the eyes, and the examination of visual acuity by the Snellen Vision Chart upon entrance to the University of Illinois. Since this method is admittedly an incomplete test for visual defects, the author recognizes that many cases of muscle imbalance and other eye disorders are present among the student body that cannot be determined by this type of examination. The following information was obtained from the student:

Name and address of person from whom the student obtained examination for glasses; whether that person was a physician or an optometrist. The date when glasses were first obtained. The date of the last ocular examination. Whether the lenses were changed, and what symptoms of eyestrain, if any, were present with glasses.

At a later date the student's vision was rechecked.

* From the University of Illinois Health Service.

The physicians' names were checked in the American Medical Association Directory to determine whether they were practicing medicine, or ophthalmology, or ophthalmology and otolaryngology. The departments of education and registration for licensing optometrists were contacted, and information regarding the requirements for the practice of optometry from the various states was obtained.

RESULTS

In order that the results of this investigation might be as accurate as possible, the students' records were classified into groups according to the time at which their glasses were obtained.

- I. Those whose vision was not normal with glasses; examined within the last year by oculist or optometrist.
- II. Those with marked and rapid progressive changes.
- III. Those having incorrect vision with glasses; not examined within the last year.
- IV. Total number of students with incorrect vision.

It will be seen in table 1, that 62, or 19.8 percent of 313 students examined by the oculist within the last year had subnormal vision. Since 41 had marked change in visual acuity, and, allowing for this progressiveness after the examination by the oculist, there remained 21 with uncorrected vision, or 6.7 percent. Of the 248 with defective vision examined by the optometrists within the last year, 100, or 40.3 percent had subnormal vision with glasses. With the markedly progressive cases deducted, there still remained 32.3 percent who had

TABLE 1
COMPARATIVE STUDY OF REFRACTIONS DONE BY OCULIST AND OPTOMETRIST

	Oculist			Optometrist		
	No. students checked with glasses	No. with defective vis. with glasses	Percent students with improper correction	No. students checked with glasses	No. with defective vis. with glasses	Percent students with improper correction
<i>Upperclassmen</i>						
Examined within past year	313	62	19.8	248	100	40.3
Marked change in visual acuity within last year with present glasses not correcting same		41	13.		20	8.
Incorrect vision with glasses with marked visual change deducted		21	6.7		80	32.3
Examined previous to last year	214	48	22.4	191	76	39.8
Total examined	527	110	20.8	439	176	40.
<i>New Students and Freshmen</i>						
Examined within past year	164	21	12.5	163	61	37.
Examined previous to last year	44	9	20.4	79	21	26.5
Total examined	208	30	14.4	242	82	33.8
GRAND TOTAL EXAMINED	735	140	19.0	681	258	37.8

defective vision with glasses. Of the students wearing glasses which had not been rechecked within the past year, 22.4 percent examined by the oculist and 39.8 percent examined by the optometrist had defective vision. Considering the entire group of upperclassmen, and including all defects, 20.8 percent of those refracted by the oculist and 40 percent of those refracted by the optometrist had defective vision at the time of this investigation. Among the entire group of 1416 students, including all eye defects, 19 percent examined by the oculist had improper correction, whereas 37.8 percent examined by the optometrist had sub-

normal vision with glasses. A comparison of the symptoms of students who wore glasses and were examined by each profession is given in table 2. Of those refracted by the oculist 5.2 percent had one or more symptoms, as compared to 16.3 percent with symptoms who were examined by the optometrist. Those students with symptoms, whose visual acuity had changed since the last examination by the oculist or optometrist, were not included. This leaves only 1.9 percent of the students refracted by the oculist with symptoms in contrast to 11.1 percent of those with glasses obtained from the optometrist.

TABLE 2
A COMPARATIVE STUDY OF THE OCULIST AND OPTOMETRIST IN THE CORRECTION OF SYMPTOMS DUE TO REFRACTIVE ERRORS

	Oculist	Optometrist
Total no. of students examined	709	655
No. with symptoms, wearing glasses	37	107
Percentage with symptoms, wearing glasses	5.2	16.3
No. with change in visual acuity since last examination by	23	29
No. with symptoms, wearing glasses, with visual changes deducted	14	78
Percentage with symptoms, wearing glasses, with visual changes since last examination deducted	1.9	11.1

STATE LAWS GOVERNING THE PRACTICE OF OPTOMETRY

The laws governing the practice of optometry vary in different states. Some are very definite and limited, while others are more elastic. Let us quote some of these.

California¹—The practice of optometry is the employment of any means other than the use of drugs for the measurement of the powers or range of human vision or the determination of the accommodation and refractive state of the human eye, or the scope of its functions in general, or the adaptation of lenses or frames for the aid thereof. Texas,² North Carolina,³ and Pennsylvania⁴ have laws which are also very specific and similar to the above.

In Indiana⁵ the practice of optometry is defined to be any of the following acts, or any combination of, or part of the following acts:

- (a) Examination or diagnosis of the human eye, to ascertain the presence of abnormal conditions or functions which may be diagnosed, corrected, remedied, or relieved; or the application or prescription of lenses, prisms, exercises, or any physical, mechanical, physiological, or psychological therapy or the employment of any means, for the purpose of detecting any diseased or pathological condition of the eye, which may have any significance in a complete optometric diagnosis of the eye or its associated structures.
- (b) The application, use, or adoption of physical anatomical, physiological, or any other principle through scientific professional methods and devices to the examination of the eyes and vision, measuring their function for determining the nature and degree of their departure from the normal, if any, and the adopting of optical, physiological, or psychological measures, and for the furnishing or providing any prosthetic or therapeutic devices for the emendation thereof.

Most of the original laws governing the practice of optometry date from 1919, although there were a few states which

had some regulations as early as 1909 and 1911. State statutes have been revised from time to time until at present the rules and regulations governing the requirements for licensing and conduct of the optometrists are much improved. Oklahoma,⁶ California,^{1a} Ohio,⁷ New York,⁸ Vermont,⁹ Indiana,^{5a} New Jersey,¹⁰ Minnesota,¹¹ Virginia,¹² Idaho,¹³ Maine,¹⁴ Missouri,¹⁵ and Florida¹⁶ now have, or will have in effect next year, laws requiring that optometrists must be graduates of a recognized high school and subsequently graduated from a four-year course in an optometry school recognized by the International Optometry Board.

Pennsylvania,^{4a} New Hampshire,¹⁷ Rhode Island,¹⁸ North Carolina,^{3a} Tennessee,¹⁹ Iowa,²⁰ Massachusetts,²¹ and Louisiana²² require graduation from at least a three-year recognized school of optometry. In 1939 or 1940, the New Hampshire Board is recommending that two years of regular college and two years of intensive optometrical work in a grade-A optometry school and a one-year apprenticeship in an optical establishment be required.

Florida,²³ Wisconsin,²⁴ Illinois,²⁵ Colorado,²⁶ Kansas,²⁷ Montana,²⁸ West Virginia,²⁹ and Oregon³⁰ require only two years of optometry training after graduation from a four-year high school. Illinois statutes are particularly weak, in that they not only fall in this group, but also allow candidates to be admitted to the State Board examination by serving an apprenticeship of two years to a registered optometrist.

Several of our states have passed regulations within the last one to three years, prohibiting "bait" advertising, price advertising, free examination, free consultation, or any similar catch phrase, statements of exaggeration, high-sounding technical terms, unsupported claims

of superior service or ability, employment of steerers to obtain business, and advertisement of the down-payment plan. Among these states are North Carolina,^{8b} Wisconsin,^{24a} Massachusetts,^{21a} West Virginia,^{29a} Virginia,^{12a} Minnesota,^{11a} Indiana,^{5b} Washington,³¹ California,^{1b} Oklahoma,^{6a} Florida,^{23a} New Jersey,^{10a} and Tennessee.^{19a}

The use of "Doctor" as a prefix, without using optometrist as a suffix, or in any way suggesting that the examiner is a physician or other practitioner, constitutes a cause for revocation or suspension of his certificate of registration in the states of Minnesota,^{11a} Pennsylvania,^{4b} Florida,^{23b} California,^{1c} and Colorado.^{26a} In New York,^{8a} the degree Doctor of Optometry is not conferred unless that person has graduated from a school of optometry conducted as a department of a university, registered by the Board of Regents with either B.A. or B.S., and a certificate of graduation in optometry.

Some state optometry laws require specified equipment that the optometrist must have. It is also a requirement of Florida,^{22c} Massachusetts,^{21b} and Ohio^{7a} that complete case records must be kept, including the following:

Vision
Ophthalmoscopic finding
Corneal curvature
Retinoscopic findings
Muscle coordination in reading
Presbyopia determination
Prescription, if prescribed
Vision corrected:
Fusion (stereoscopic appreciation)

REQUIREMENTS OF "CLASS A" OPTOMETRY SCHOOLS

In 1933 and 1934 a survey of all the optometry schools was made resulting in the adoption by the International association of Optometry Boards in the Toronto 1934 convention of the list of accepted and classified optometry schools. There

are 10 Class-A schools at present:

1. College of Optometry, Toronto
2. Columbia University School of Optometry, New York
3. Los Angeles School of Optometry, Los Angeles
4. Massachusetts School of Optometry, Boston
5. Northern Illinois College of Optometry, Chicago
6. Ohio State University College of Optometry, Columbus
7. Pennsylvania State College of Optometry, Philadelphia
8. Southern College of Optometry, Memphis
9. University of California School of Optometry, Berkeley
10. University of Montreal School of Optometry, Montreal

Columbia University and Los Angeles School of Optometry have required a four-year course since 1928 and 1934, respectively. Two hundred and four students have been graduated from the Columbia four-year course. There were 61 seniors this year. The Los Angeles School of Optometry has graduated 119 since the four-year course was inaugurated, with 40 of this group finishing in 1939. The Pennsylvania State College of Optometry began its four-year course in 1936 and has entered approximately 115 students per year. The class of 23 seniors graduated last term were the first group to have completed the four-year course. The Northern Illinois College of Optometry has 97 students enrolled in the four-year course, which was inaugurated in July, 1938. According to the statistical addenda 1937-1938 of the University of California, there are 12 students taking the two-year pre-optometry course and 17 students were registered as graduate students in the professional department of optometry. No accurate statistics were received from the remaining Class-A schools.

All of these schools have required a four-year course in optometry beginning September, 1938. The general outline of

the curriculum of this four-year course of study is presented:^{5c}

<i>First year</i>	<i>Hours</i>
Physics	120
Chemistry (general)	340
Biology (including comparative anatomy) ..	280
Bacteriology	128
Mathematics	240
History of optometry	32

Second year

Anatomy (histology and embryology) ..	317
Physiology (including physiological op- tics)	272
Ophthalmic mechanics	
a. Physical principles of lenses	168
b. Principles of lens making	96
Optometry	96
Geometrical optics	180
Chemistry (physiological)	119

Third year

Pathology (general)	176
Pharmacology	164
Ocular pathology	102
Geometrical optics	108
Ophthalmic mechanics (clinical applica- tion of lenses)	96
Optometry (including physiological op- tics)	144
Clinical optometry	332
Psychology (experimental and visual) ...	96
Surgery (lectures and demonstration) ...	36
Office practice	20

Fourth year

Ocular pathology	152
Clinical ocular pathology (treatment of disease)	60
Geometrical optics	68
Ophthalmic mechanics (advanced methods in clinical application)	120
Optometry	144
Clinical optometry and conferences	552
Visual fields	36
Orthoptics	48
Subnormal vision	24
Surgery, ocular (clinical and hospital demonstrations)	60

The University of California³² optom-etry course is under the Department of Physics of the Letter and Science College. The student must have a junior standing in the Letter and Science College together with the prerequisite courses. Columbia University³³ also requires junior stand- ing for admittance to its optometry school, and at the satisfactory completion of the

junior and senior year confers the B.S. degree.

A rather detailed description of the third and fourth year in optometry at Columbia University will serve to en- lighten us on the type of instruction given in the better schools of optometry.

Junior year. Geometrical optics, anatomy and physiology of the eye, theory of optometry, drafting, physical optics (facts connected with subjects as interference, diffraction, polariza- tion, double refraction, photometry, illumina- tion, spectroscopy. Optic shopwork—history and manufacture of glass and lenses and their composition, neutralization, surface grinding, centering, and so forth. Practice of optometry (ophthalmoscopy, static and dynamic skiametry, simple subjective eye testing).

Senior year. Advanced geometrical optics (subjects treated: weak lenses, combination of lenses and mirrors, optical system of the eye, optical instruments used in conjunction with the eye, aperture of field view, optometrics, correction glasses, magnifying power, chromatic aberration, and so on). Physiological optics— anatomy and dioptics of the eye, including schematic eye, ophthalmometry, ophthalmos- copy, skiascopy, accommodation, visual acuity, anomalies of refraction and others. Optical shopwork—deals with frames, edging and pol- ishing, surfacing, fitting, and adjustments. Theory of optometry—symptomatology, ex- amination of extrinsic and intrinsic ocular con- dition (strabismus, anisometropia, and so forth), fitting of spectacles, special instruments such as slitlamp, and refraction studies. Prac- tice of optometry—pathological condition of the eye (differentiation between healthy and abnormal eye). Diagnosing of pathological conditions under direction of instructor. Op- tometrical laboratory, geometrical optics— theory of optical instruments, aberration, astig- matism, astigmatic lenses and spectacle optics. Optical work shop, conservation of vision.

The Southern College of Optometry was to begin a four-year course in the fall of 1938. Its catalog³⁴ states that by the time the student optometrist gradu- ates, he should be able to recognize the usual ocular diseases and should be cap- able of differentiating between normal and morbid condition, often a very diffi- cult feat. Ocular operations of various types are demonstrated to small groups. The present second-year clinical optome-

try studies include history taking, complete ophthalmoscopic, refractive, muscle, and perimetric examination, prescription writing, mounting lenses, fitting frames, collecting bills, dismissing patient, and writing and mailing the patient a follow-up letter. The catalog further states that the students are capable refractionists by the end of the second year.

Some of the optometry schools also include hygiene of the eyes, optometrical psychology, a greater amount of surgery lectures and demonstrations, and more emphasis on pathology and diagnosis as related to other diseased conditions of the body, optometrical ethics and publicity, optometrical jurisprudence, and optometrical economies.

It is apparent that sooner or later all states will require an optometrist to be a graduate from a recognized Class-A school of optometry before he will be admitted to the state examination for license to practice.

THE OBJECTIVES OF MODERN OPTOMETRY

The objectives and limitations of the optometrist as related by B. W. Hazell,³⁵ chairman of the educational committee, International Association of Optometry Boards, follows:

1. He must be educated in our professional school and be able to correct and treat all refractive errors.
2. He must obtain sufficient knowledge and be able to diagnose all diseases that in any way affect vision.
3. He must be given a thorough knowledge of the brain and all the nerves connected therewith.
4. He must be able to diagnose any pathological condition that affects vision.

His education must be sufficient to make him a recognized eyesight diagnostician. This knowledge obtained by the future optometrist is not for the purpose of practicing medicine, but is needed for diagnosis so as to enable him to intelligently guide his patients to the physician most capable in treating the condition present.

It is interesting to note some of the broad objectives sponsored by certain of the optometry colleges. The catalog from the Pennsylvania State College of Optometry³⁶ defines optometry as the science which deals with the structure, function, and diseases of the eye. The practice of optometry is defined as the ascertaining and correcting of abnormalities of the human eye and accessory visual system. "The practice of optometry utilizes its fundamental sciences directly to a greater extent than any other profession dealing with the human body."³⁶ The first two years of training include the fundamental sciences such as mathematics, physics, geometrical and physical optics, chemistry, anatomy, physiology, pathology, and pharmacology. The last two years include theoretical and applied optometry, physiological optics, ocular therapeutics, advanced ocular diagnosis, principles of surgery, and clinics.

Some of the objectives to be derived from the course in physiology are:

2. To use physiology as a basis for the study of pharmacology, pathology, clinical optometry.
4. To understand the physiologic basis of diagnostic procedures which the practicing optometrist may find necessary to utilize or which he may request a consulting physician or laboratory diagnostician to apply.

Aside from investigating physiological principles, the students are enabled to familiarize themselves with the use of operative instruments and the action of drugs.^{36b}

Objectives of the bacteriology course—

1. To understand and appreciate the part played by microorganisms in the production of disease, including ocular and other diseases and sequelae.
2. To use bacteriology as a partial foundation for the study of later courses of the ocular curriculum which deal with prevention, diagnosis, and treatment of ocular diseases.
3. To use bacteriological methods in the pre-

vention, diagnosis, and treatment of ocular disease.^{30c}

Objectives of the pathology course—

General Pathology:

1. To recognize and understand disease process, morbid anatomy, and physiology.
2. The application of anatomy, chemistry, physiology, and bacteriology to the explanation of disease processes.
3. To relate chemical manifestations of disease to anatomic and physiologic changes associated with disease.
4. Pursue the study of later courses which deal with the prevention and treatment of ocular disease.

Ocular Pathology:

1. To understand and recognize disease processes, morbid anatomy, and physiology of ocular region.
2. To estimate the outcome of the disease processes under study with and without treatment.

The student is drilled in the symptomatology and differentiation of diseases of the eye and appendages. Manifestation of ocular conditions as associated with systemic diseases, and the significance of alterations in blood pressure and urine are stressed.^{30d}

Chemistry Objectives:

The understanding of the principles underlying the chemical processes taking place in the body with special reference to their application to clinical optometry and to chemical examinations which the optometrist may require for his practice.^{30e}

Pharmacology Objectives:

1. To understand drugs, systematically prescribed for patients who come to the optometrist's office.
2. To familiarize the student with pharmaceutical preparation used in ocular diagnosis and therapeutics.
3. To familiarize the student with the action of drugs on the vital tissues.
4. To enable the student to read and evaluate literature and discussions on subjects of pharmacology.

Students are required to become familiar with prescription writing and therapeutic dosage of all ocular medicinal preparations.^{30f}

Ocular Therapeutics—Objectives:

1. To understand the clinical application of the principles learned in pharmacology.
2. To understand the general procedure followed in ocular therapeutics.
3. To recognize ocular manifestations of systemic disease, the physiological action of drugs, and the study of applied therapeutics with consideration of the conditions under which each drug may be used in the examination and treatment of ocular disease.^{30g}

H. E. Pine,^{35a} president of the American Optometric Association, states, "Optometry, in my opinion, has a very bright future and is destined to eventually be a profession to which is allocated the detection and correction of all ocular difficulties. The modern optometrist now is so far ahead in refraction of others who have invaded this field, that it will be impossible for medical propaganda to keep this fact from general public acceptance."

Many of the more progressive and conscientious optometrists realize and have admitted that it is necessary for a person dealing in the examination and correction of abnormal vision to know the anatomy, physiology, etiology, pathology, and clinical diagnosis of diseased conditions of the body that may affect the eye as well as the detailed or minute knowledge of the abnormal ocular condition and the correction thereof. Unless physicians and surgeons have been sadly misinformed through the teachings of our medical schools, the most important objectives of medical training are prevention, diagnosis, and treatment. Diagnosis is very important, and it cannot be thoroughly learned in one or two years. Didactic work in itself is not sufficient. An abundance of clinical material portraying all the variations from the normal are necessary in order that the student may actually see these abnormal cases. After the proper diagnosis is made, treatment can be instituted. Most of our pres-

ent-day optometry schools are attempting to teach the diagnosis of all ocular abnormalities and how these disorders may be related to all other diseased conditions of the body. Some of the optometry schools even give instruction in drugs and surgery.

Although anatomy, pathology, and therapeutics are taught by physicians in a few of the optometry schools, by far the majority of the instruction is done by persons with a Bachelor's or Master's degree or by "Doctors of Optometry."

Fortunately, the majority of people do not have serious diseases of the eyes. But we cannot ignore the not-infrequent loss of vision from chronic simple glaucoma and uveitis from lack of adequate care, and the fact that failing vision may be one of the earlier symptoms of some more serious disease for which it is most important that proper early diagnosis and treatment be sought, for the correction of the disease and the conservation of the patient's vision. A pair of glasses only serves as a visual crutch for that individual. It does not remove the cause. Just because the majority of persons do not have serious eye diseases makes it a bad policy to ignore looking for these diseases when making an ocular examination.

THE OPTOMETRISTS' CRITICISM OF THE OPHTHALMOLOGIST AS A REFRACTIONIST

The optometry profession condemns the medical profession in the refraction of eyes. There are two facts for which, at least superficially, they are somewhat justified in their criticism. The optometrists publicize the fact that the science of theoretical and applied optometry is not taught in our medical schools. It is true that the tradesman's aspect of lens grinding, fitting of frames, and detailed

study of theoretical and applied optometry are not a part of the regular medical curriculum. The pre-medical training includes courses in physics, trigonometry, chemistry, and the biological sciences, followed by the physiology of the eye, visual fields, didactic work, and eye clinics in the regular medical courses. The regular medical curriculum does not adequately train the physician for any specialty. In order to be a capable specialist in any branch of medicine, whether it be dermatology, neurology, psychiatry, urology, radiology, ophthalmology or otolaryngology, any of the special divisions of surgery, or any of the other specialties, the physician must take postgraduate work. No physician is considered a specialist when he is graduated from a medical school. However, the background of general medicine is the only firm foundation on which a specialty can be built. The second objection the optometry profession raises is that there are no restrictions to prevent the licensed general physician from testing the refraction of eyes. This is true, but in this day of increased medical knowledge few physicians feel capable of confining themselves to a specialty unless they have spent adequate time in postgraduate work preparing for that specialty. In table 3 it will be noted that of all the students examined by physicians, only 5.1 percent had refractions performed by the general physician, as checked against the American Medical Association Directory. Eye, ear, nose, and throat specialists examined 37.1 percent of the students (the amount of specialization not designated) and 57.8 percent of the students were examined by physicians belonging to one or more of the following groups: American Academy for Ophthalmology and Otolaryngology, American Board of Ophthalmology, American Ophthalmological So-

ciety, American College of Surgeons.

Another objection to the ophthalmologist frequently used by the optometrist is the use of "drops" or cycloplegics in the eye, but there are many cases where cycloplegia is necessary, especially in children and young adults, for a thorough examination. In the cross-eyed child complete atropine cycloplegia is an absolute necessity for proper refraction. The optometrists are prohibited by law from using drugs in the eye or internally. Would this be a very vital reason for their objection to the use of "drops"? Undoubtedly one reason for the differ-

from most optometry schools. The ophthalmologist spends about six years more than this in his preparation.

NEEDS FOR BETTER REGULATIONS GOVERNING THE MEDICAL SPECIALTIES

There is a recognized need for more adequate control of our medical specialties. The ideal arrangement would be to require a general medical education and then a specified amount of postgraduate work in ophthalmology for all persons who are planning to take up this profession as a specialty. State specialty boards or state medical boards should be given

TABLE 3
COMPARATIVE STUDY OF PHYSICIANS DOING REFRACTION

	General Physician	*Oph. and Boards	**OALR	Total exam. by physician
Number of students examined by	36	410	263	709
Percentage examined by	5.1	57.8	37.1	52
No. with incorrect vision with glasses, examined by	7	60	65	132
Percent with incorrect vision with glasses, examined by	19.4	14.6	24.7	18.6

* Physicians practicing only ophthalmology and physicians belonging to one or more of the following—American Board of Ophthalmology, American Academy of Ophthalmology and Otolaryngology, American Ophthalmological Society, American College of Surgeons.

** No data as to the amount of specialization done in ophthalmology.

ence in the results obtained by the two professions (table 1) is that a cycloplegic was needed in many of these cases for proper examination and refraction.

Certainly, diagnosis is very important. One of the purported objectives of optometry is to be able to diagnose all disorders of the eye. Several of these schools teach the action of drugs, therapeutics, and ocular surgery, even though they are prohibited by law from using them. Where is the line of demarcation to be drawn between the two professions? There are no short cuts in the preparation to practice general medicine or any of its specialties, and the diseases and disorders of the eye are no exception. Four years is now required for graduation

the power to determine the proficiency, whether it be by credentials, examination, or certification by the American Board of Ophthalmology, and to register or license those properly trained to practice this particular specialty. In fact, this should apply to other specialties in medicine as well. Not only would this raise the standards of the medical profession beyond criticism, it would insure to the public the adequate ability of any physician practicing that specialty.

NEED FOR BETTER CONTROL OF THE PRACTICE OF OPTOMETRY

Due credit must be given the present-day optometry profession for raising its standards within the past 20 years to

TABLE 4

STUDENT ANSWERS TO QUESTION, "WHAT IS THE DIFFERENCE BETWEEN AN OCULIST AND AN OPTOMETRIST?"

Total No.	No. Wrong	Percent Wrong	No. Correct	Percent Correct
1873	1389	74.1	484	25.8+

the level described herein. Unfortunately, many optometrists are still in practice who know very little about refracting and nothing about the diagnosis of pathological conditions of the eye. If optometry is to serve the public efficiently, better training under competent men in the field of the medical sciences must be given if the causative factors of defective vision and pathological conditions are to

uninformed or misinformed on these terms.

Some criticism has been raised in reference to the prices paid for eye examination and glasses. In order to ascertain the comparative prices between the optometrist and the oculist, statistics were gathered on the prices paid by the students, according to the degree of eye defect. In table 5, the results are tabu-

TABLE 5

COMPARATIVE PRICES PAID FOR OCULAR EXAMINATION AND GLASSES BY STUDENTS

Vis. defect without glasses	Oculist			Optometrist		
	Number students	Av. Price for exam and glasses	Var. in price	Number students	Av. price for exam and glasses	Var. in price
20/20	133	\$16.45	\$6.50-25.00	137	\$15.08	\$5.00-27.00
20/25	89	15.75	7.50-30.00	121	14.17	7.00-34.00
20/30	48	15.77	8.00-27.00	63	15.32	7.50-38.00
20/40	32	16.00	10.00-16.50	38	14.28	8.00-20.00
20/50	30	16.40	10.00-25.00	19	13.42	10.00-17.00
20/65	32	17.57	9.00-30.00	54	15.46	7.00-23.00
20/100	71	17.50	6.00-41.00	59	14.72	8.00-25.00
20/200	139	17.00	7.50-35.00	157	16.00	7.00-45.00
Total	575	\$16.50		648	\$15.00	

Average price of both oculist and optometrist = \$15.75

be recognized readily. With the increasing knowledge of physiology, etiology, and pathology of ocular abnormalities and their treatment, the practice of optometry is gradually converging toward ophthalmology.

Today very few people actually have any conception of the difference between the oculist and the optometrist. In a survey made (table 4) 1,873 university students were asked to differentiate the two terms. Even with very liberal grading only 25.8 percent had some idea of the difference and 74.1 percent were entirely

lated. The average charge made for the oculists' examinations and for glasses was \$16.50, whereas the cost for examination and glasses obtained from the optometrist averaged \$15.00. It will be noted the variation in price is greater in the optometrist group in five out of the eight defect classes.

SUMMARY

A study of 1,416 students has revealed that 37.8 percent examined by the optometrist and 19 percent by oculist did not have normal vision with glasses as de-

terminated by the Snellen test. After deducting those cases with marked change in visual acuity within the last year there still remained 32.3 percent examined by the optometrist and 6.7 percent by the oculist who had defective vision with glasses.

After deducting those students with visual changes since their last examination by the oculist and optometrist there remained 1.9 percent and 11.1 percent respectively, of the students with symptoms related to ocular disorders.

Practically three fourths of the students were unable to differentiate the oculist from the optometrist.

The average cost of the ocular examination and glasses was about 10 percent greater in the oculist group than in the optometrist group.

There is need for better medical regulations to determine the proficiency, and for the registration and licensing of physicians representing themselves as specialists.

The Class-A schools of optometry have raised their requirements to a four-year course. Several of these schools are at-

tempting to teach pathology and diagnosis. Examples of the curricula are given. In the light of existing circumstances it would seem that much of the teaching is "futile." Since a knowledge of general medicine is a necessary foundation for the study of the etiology, pathology, and diagnosis of ocular disease, and there exists such a limited number of capably staffed postgraduate institutions, optometrists according to their present preparation can never serve the public as efficiently as can the ophthalmologists. Eventually, if the practice of optometry is to continue in the direction it is now pursuing, the medical schools may find it necessary to absorb the teaching and control the practice of this profession.

Otherwise, when and if the professional standards and ethics for the practice of optometry reach a higher plane, it may be possible that the same coöperation may exist between the medical and optometry professions as is now present between the practices of medicine and dentistry in serving the public efficiently.

Eye, Ear, Nose and Throat Hospital.

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DYSTROPHIA ADIPOSA CORNEAE

HOWARD CLAY KNAPP, M.D.
East Saint Louis, Illinois

At the meeting of the American Ophthalmological Society held in 1932, Dr. Dewey Katz reviewed the literature on this subject and presented the ninth reported proved case. It is my purpose to offer a case of this nature and to bring to date the reference in the literature. My case has not been proved by microscopic examination of corneal tissue.

CASE REPORT

I. M., a colored female, aged 28 years in 1932, at the time of her first visit, was sent to me by the Illinois Emergency Relief Commission because of her complaint of sore eyes. She stated that she had had "white scars" on both eyes as long as she could remember and that the "scars" were slowly increasing in size (fig. 1). She had had several attacks of very sore eyes with watering, redness, and sensitiveness to light. Since the age of 14 years she had developed increasing numbers of small and large fatty tumors of the skin, irregularly distributed over the body, extremities, head, and neck.

On the date of the first examination the vision was 3/60 and 6/60, not improved. Lids, cilia, and lacrimal apparatus were normal. The palpebral and bulbar conjunctiva in both eyes showed

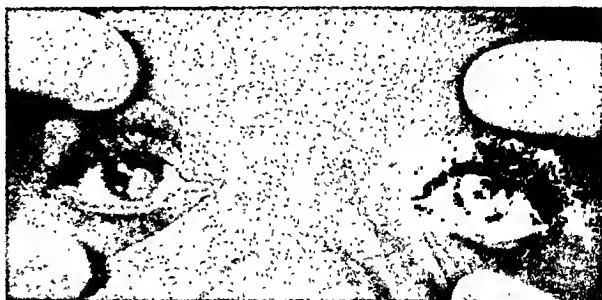


Fig. 1 (Knapp). Dystrophica adiposa corneae

moderate injection, and there was a mild pericorneal injection present in the right eye. Ocular movements were normally performed. The cornea of the right eye showed one rather large patch of solid white area about four millimeters in diameter. There were no plaquelike deposits around the limbus. The cornea of the left eye showed a similar but larger patch of solid white, calcareouslike deposit oc-

cupying about one third of the lower half of the cornea below the normal pupillary area. Superficial and deep vessels passed into the cornea in the vicinity of this opaque area. The corneal reflex was normal in both eyes. Anterior chambers, irises, and fundi were normal. The tension was 18 mm. in the right eye and 20 mm. in the left eye (Schiötz tonometer with normal readings of 18 to 22 mm.).

Slitlamp examinations showed deep and superficial corneal vessels. The corneal opacities lay within the corneal stroma. There was no bulging of the corneal surface. The margins of each deposit were clearly outlined. The deposits appeared to be of completely homogeneous structure.

Physical examination revealed nothing of especial importance except for the cutaneous xanthomatosis, as diagnosed by an internist (figs. 2 and 3). He described multitudes of fatty tumors, some circumscribed, some lobulated, some flattened, some pedunculated, covering most of the skin surface except the soles of the feet and palms of the hands. These tumors seemed to originate in subcutaneous tissue, and some were tender. One tumor excised from the chest showed, microscopically, fat in large dilated cells, arranged in compact lobules held together by a fibrous stroma. This type of lipoma is said to be a slow-growing tumor increasing within itself, expanding so as to compress surrounding tissues or to project above the body surface. Although commonly described as tumors, this type seems to be rather the result of local accumulations of lipid substances in degenerated cells. It is most usually found in association with jaundice, diabetes, pregnancy, and other conditions in which the lipid content of the blood is altered. These tumors also are present in internal organs, the

mesentery, in the submucous and subserous tissues of the whole alimentary tract, and even in the meninges.

On our patient blood examinations gave normal results. Urinalysis and Wassermann and Kahn tests on blood and spinal fluid were twice negative. Four blood cholesterol determinations in varying relations to meals were within normal limits (162 to 199 mg. per 100 c.c.). Ear, nose, and throat examinations were negative. X-ray studies of sinuses, head, long bones, and chest were not interesting. Dental examination showed many losses, some pyorrheal infection but no apical abscesses. Pelvic examination suggested the presence of sequellae of an old gonorrheal process.

Over a period of six years there has been a slow but steady increase in the size of the corneal lesions. It seems likely that the entire cornea of each eye will eventually be affected. The original lesions now show definite staphyloma formation. There have been numerous periods of smarting, burning, injection, lacrimation, and photophobia, lasting from a few days to three weeks. Between these attacks the inflammatory symptoms have been absent. Vision was decreased to 1/60 and 3/60 with the best correction, a minus sphere. In spite of the disability, the patient has been able to continue arduous W.P.A. duties.

The question of a corneal transplant has been considered but any type of operation is flatly refused.

DISCUSSION

It is the opinion of Katz and Delaney and E. V. L. Brown that fatty degeneration of the cornea occurs as a result of some unexplainable impairment of the physiological functioning of the corneal cells. Pyknosis and vacuolation occur in these cells. Fat brought to the cornea is not completely oxidized and is deposited



Figs. 2 and 3 (Knapp). Distribution of fatty tumors over skin surface, except soles of feet and palms of hands.

within the cells in the form of cholesterol and its esters. These fat deposits within the cornea result in a chemical irritation producing vascularization of the cornea and pericorneal injection.

While it seems likely that the incidence of fatty degeneration of the cornea is larger than is indicated by available case reports, there are several differential diagnoses to be made. For example, there is the xanthomatosis bulbi of von Szily, occurring after injuries and affecting various portions of the eyeball; there is the fatty degeneration of the cornea secondary to inflammations of the cornea or uveal tract; and there is Axenfeld's dystrophia calcarea.

The first reported case found was that of Kamocki in 1893 (*Archives of Ophthalmology*, 1893, v. 39, p. 209), who at this time described the cells now known as histiocytes that are characteristic of the microscopic picture. The last reported case found was that of Takajasu

(*Archives of Ophthalmology*, 1936, v. 96, p. 872). All showed lacrimation, pericorneal and conjunctival injection, the characteristic corneal deposits, and a decrease in visual acuity. Some showed reduced corneal sensitivity; some lacked the histiocytes described by Kamocki. In none was there evidence of previous inflammation of cornea, sclera, or uveal tract. Ages varied from 16 to 65 years. In some the blood-cholesterol content was normal, in some as high as 266 mg. per 100 c.c., and in some undetermined. In some the corneal deposits were central and in some peripheral. In 15 cases the disease process was bilateral, and in three cases unilateral.

The typical microscopic picture, best described by Delaney, showed a variation in thickness of the epithelial layer of the cornea caused by a variation in the number of cell layers (from three to five) and by a change in the shape of the cells in the basal layer from columnar to

cuboidal. Occasional mitotic figures are present in the basal-cell layer and rarely in the middle-cell layers. There is a marked increase in the numbers of wandering cells, leucocytes, and lymphocytes, great numbers being present on Bowman's membrane between the basal cells. Between the basal-cell layer and Bowman's membrane there is usually found an increase in connective tissue with many spindle-shaped nuclei. Bowman's membrane is frequently split into lamellae, and there are areas in which this membrane is completely absent. The lamellae of the corneal stroma vary greatly in thickness. Many show degenerative phenomena, such as vacuolation. Large numbers of neutrophilic leucocytes, an increased number of lymphocytes, and some pyknotic nuclei are present. In formaldehyde-Zenker-fixed Giemsa-stained sections, large, oval-shaped, pale-staining nuclei resembling endothelial cells are found in the widened interlamellar spaces. Among these cells a majority of reporters found many histiocytes varying in size, with well-stained nuclei and nucleoli, vacuolated cytoplasm, and fairly well-outlined margins. The accumulations of leucocytes and lymphocytes are more dense in some areas and show no definite relationship to blood vessels. Sections stained with hematoxylin and scarlet red show granules, or masses, or both, in all layers of the cornea except Descemet's membrane and the endothelium. In the corneal stroma the diffuse fatty distribution varies considerably and intensely. In places fat droplets coalesce to form irregularly shaped fat bodies in varying sizes. The greater part of the fat so stained was extracellular, although red-stained fat-laden histiocytes were readily identified. In Delaney's opinion there was proof that although neutral fat was present, the fat substance in the patho-

logic corneae consisted mainly of the cholesterol-fatty-acid group.

The connection between the lipomatosis and the corneal dystrophy in my case has not been established. The authors of the various previously quoted reports of fatty degeneration of the cornea differ in their opinions as to whether the fat changes present were in the nature of an infiltration or degeneration. Many pathologists have ceased to speak of "fatty infiltration" and "fatty degeneration" because of the frequent impossibility of differentiating the one from the other. They use the term "fatty change" for all fatty processes.

Virchow's definition of fatty infiltration—an excessive accumulation of fat in the cells in the form of large droplets without destruction of the nucleus or irreparable damage to the cell—was postulated in 1847 and is still uniformly accepted. In this condition the fat enters the cell from without; in the form of fat droplets, it fuses together under the pressure of the cytoplasm; the cell remains structurally normal or nearly so; it is not functionally damaged and is capable of returning to its normal condition whenever the fat is removed. Under normal conditions there is little free visible fat in the cells of the parenchymatous organs, because it is largely used up through oxidation by the action of the intracellular oxidase. When, for any reason, the oxidative power of the parenchymatous organ is reduced, fat accumulates in it, and we find an excess of fat in the parenchymatous cells. When oxidation in a cell is checked by toxins, poisons, loss of nutrition, or other means, the accumulation of fat brought to it will go on uncontrolled. Added to this is the fact that each cell contains lipins—fats and lipoids—the amount of which varies with the different organs. The lipins are so combined that they are not

stained with the usual fat stains nor can they be extracted with ether. They are referred to as "invisible fat." They, however, become liberated during an autolytic process and become "visible"; that is, identified as lipins by certain of the fat stains or by polarized light. Thus, when we have the accumulation of fat in a disintegrating cell, we have fatty degeneration. The fat in this process may enter the cell from without or may be derived from within, usually both; the cell is functionally damaged and would be incapable of returning to its normal condition were the fat removed.

In disintegration of tissue, cholesterol and its esters accumulate because these substances are not very soluble and are not destroyed during autolysis. The characteristic plates of cholesterol may be seen in any tissue in which cells are undergoing slow destruction. Cholesterol and its esters may be slowly removed by the histiocytes that phagocytose these

substances. These cells are often found surrounding them.

It is believed that when the blood contains an excessive amount of fat, it passes in larger amount than normal into the blood lymph and thence over into the tissue. The role played by the cholesterol is not certain. It is probable that it serves as a vehicle in the transportation of fat. It is possible that it may also favor the precipitation of neutral fat out of the tissue fluids into places where deposition of neutral fat alone does not usually occur.

That another factor besides a high cholesterol content of the blood is essential in the production of a lipomatosis or a dystrophia adiposa corneae is shown by the fact that in various other diseases—lipoid nephrosis, for example—the cornea remains uninvolved although the blood cholesterol is far above the high normal.

234 Collinsville Avenue.

THE EFFECT OF SULFANILAMIDE ON THE COURSE OF TRACHOMA*

L. A. JULIANELLE, PH.D.
Saint Louis

J. F. LANE, M.D.
Albuquerque, New Mexico

AND

W. P. WHITTED, M.D.
Gallup, New Mexico

The introduction of sulfanilamide as a therapeutic agent primarily for streptococcal infections was received with unprecedented acceptance by the medical profession at large. Faith in its chemotherapeutic capacity became so extensive as to tender it experimental trial in a large number of infections, bacterial, viral, protozoal, and rickettsial. It was perhaps only a natural sequence that with time the effectiveness of sulfanilamide in trachoma also be determined. Since the original report by Heinemann,¹ followed rapidly by that of Lian² and Dik,³ several publications have appeared in this connection, as will be brought out in the discussion of this paper. The success of this treatment, however, was so striking in Loe's⁴ experiments, that when the opportunity was afforded to conduct a therapeutic study on the Navaho reservation, as published elsewhere,⁵ it was proposed to investigate simultaneously the possibilities of sulfanilamide in trachoma. With the facilities and coöperation of the U. S. Indian Service,** this

study has been completed and the present communication is a report of the results observed.

METHODS OF STUDY

Except for six white patients who were treated later at the Washington University Medical Clinics, the survey was carried out on Indians. The treatment recommended by Loe⁴ was adopted bodily for the large majority of the patients, what modifications were made being dictated to a great extent by uncontrollable conditions. Loe's method consists of oral administration of sulfanilamide, one-third grain per pound of body weight for the first 10 days of treatment, with a reduction to one-fourth grain for the following 14 days. The daily total was divided into three doses in multiples of five grains and any inequality of sulfanilamide on this basis was compensated by giving the largest quantity in the evening before retiring. An equivalent amount of sodium bicarbonate was given in tablet form. In addition, it was found desirable to irrigate the eyes each morning with saline-boric-acid solution, and in a few instances atropine was applied locally when indicated to mitigate the pain and discomfort of corneal ulcers.

*From the Department of Ophthalmology, Washington University School of Medicine, and the U. S. Indian Service. This work was conducted under a grant (to L. A. J.) from the Commonwealth Fund of New York.

**The opportunity for conducting this study was made possible by the efforts of Drs. J. G. Townsend, W. W. Peter, and Polk Richards, of the U. S. Indian Service. In addition, we acknowledge gratefully the coöperation of Dr. Paul Vietzke of the Indian Service Hospital at Fort Defiance, Arizona, of Dr. Leo Schnur of the Hospital at Fort Wingate, New Mexico, of

Mother Berchmans and of Sister De Ricci of St. Michael's School in Arizona, for extending the facilities and privileges of their respective institutions, and to nurses G. Engelman, M. Alexander, and R. Moldenhauer of the Indian Service.

The progress of the treatment was followed by clinical examination and by determination of visual acuity at the end of each week. In order to control the toxicity of the drug, temperatures were taken each day and in the majority of the patients complete blood counts and hemoglobin estimations were made at least twice a week, the latter values being determined by the Sahli method. Other toxic symptoms were established by clinical observation.

RESULTS OF THE TREATMENT

In order to facilitate a more coherent presentation and discussion of the data, it seems necessary to consider the results of treatment in reference to the variety of trachoma studied. For this purpose, the different patients have been classified as representative of (1) primary, uncomplicated trachoma, (2) trachoma superimposed with secondary infection, and (3) so-called "flare-up" trachoma.

Effect on Uncomplicated Trachoma. Preliminary studies were undertaken in two groups of patients, one treated at Fort Wingate and the other at Shiprock, New Mexico. The first series was 24 in number, with uncomplicated trachoma in various stages. At the end of treatment, the condition in 3 was unchanged, in 17 improved, and in 4 arrested. It is interesting that six months later two of the older patients with corneal trachoma presented themselves for treatment at the Indian Service Hospital at Fort Defiance. Their corneal condition was active, although the lids, as previously, were of little importance. They were treated with tartar emetic, the condition becoming definitely improved though not arrested, and their vision was correspondingly better (cf. ref. 5, patients T_{10} and T_{11}). It may be pertinent to add that one of these patients underwent an acute "flare-up" two to three

months following conclusion of treatment. A second course of sulfanilamide was carried through and the individual was followed for approximately a year in all. At the end of this time, his clinical condition was about the same as when originally observed. Two other patients in this group were examined six months later, both were improved but still clinically active. The second series of 24 patients included for the most part school children, but also several elderly individuals whose symptoms were predominantly of the cornea, with the lids well scarred and only slightly active. One month after conclusion of the treatment, the eyes of 2 patients remained unchanged, of 19 were improved, and of 3 were asymptomatic.

For purposes of orientation, seven children with folliculosis were treated in the manner indicated above, and the progress of the disease during treatment was followed comparatively. It was observed that at the end of the experiment the conjunctival condition remained unchanged. Apparently, then, sulfanilamide has no effect on folliculosis.

In a third and final group of patients, observations were continued in more detail and over a greater period of time. This group comprised 29 patients—28 Navahos and 1 white person. Except for two patients to be referred to presently, the disease was characterized by only minor corneal manifestations. Clouding was slight or absent, and pannus was in its early stages, or, expressed in other terms, visual acuity in these patients still remained normal. The conjunctival disease was active, appearing in some patients as follicular, in others as papillary, and in still others as a combination of both forms. With a single exception, the conjunctiva was free of scar tissue, the exception (S_1) exhibiting only streaks of scarring be-

tween the clinically active areas. The two patients referred to earlier in this paragraph were different in clinical appearance. One, an adult (S_{10}), had had repeated attacks over a period of years and had already received a course of treatment with sulfanilamide several months previously, and was now suffering from a recurrence. The lids were smooth and completely scarred, while the corneae were turbid and diffused with heavy, generalized pannus. His vision was O.D. 6/200, O.S. 8/200. The other (S_{31}) was a white patient, a wrestler, with recent infection. The lids showed a heavy folliculosis, the corneae were infiltrated, and pannus was moderate. Active corneal ulcers were present in each eye, and his vision, taken at the time, was subsequently discarded because of the acute condition.

In 26 of the 29 patients, sulfanilamide was given as prescribed above. In two (S_{10} and S_{13}) the treatment was varied because of toxic manifestations of the drug, while in the third (S_{31} above), therapy was started on a similar basis with sulfapyradine, 420 grains in two weeks, and since no improvement was apparent sulfanilamide was substituted, 840 grains over the 24-day period. Because of the active ulcers in both eyes treatment was supplemented first with atropine, then with three applications of silver nitrate, and later with metaphen.

At the end of treatment, the following results were observed: In one patient (S_5) the condition remained stationary in the right eye, and became more marked in the left; in 23 patients (S_{1-4} , 6-9, 10, 12-20, 22-26, 28) the disease maintained approximately the same clinical appearance; in 4 patients (S_9 , 11, 21, 28) there was distinct improvement, although infection was not arrested, but still active; in the last case (S_{21}) the individual was completely asymptomatic.

This particular patient (S_{31}) was examined once a month for four months, and during this interval there was no evidence of disease; apparently, therefore, a complete arrest.

Examinations were made for epithelial-cell inclusions before treatment was begun in order to determine their behavior under the influence of the drug. In six patients, inclusion bodies were found in sufficient numbers to make this experiment significant; in the others, they either were not found or were found in such scarcity (1 to 3 per slide) as to make any subsequent examination of doubtful significance. In all six of these patients, it was not possible to find inclusions by the end of the first week of treatment, and in some in even less time. The interpretation of this observation will be considered in the general discussion.

Since the remaining members of the group were far from asymptomatic, it was felt that the treatment with sulfanilamide should be followed by local, routine administration of copper. After one month, clinical examination with Dr. Polk Richards disclosed: 5 were discontinued as patients for various reasons, leaving a remainder of 23 (excluding S_{31}); of these, improvement was slight in 6, moderate in 4, and marked in 13 although they were still active. At Dr. Richards' suggestion, all local treatment was omitted, and two months later (three months after cessation of sulfanilamide) the condition in 18 remaining patients was: about the same in 3, moderately improved in 3, markedly ameliorated, though not yet inactive, in 11, and completely asymptomatic in 1. Approximately five months after sulfanilamide was terminated, a final examination was made jointly with Dr. Phillips Thygeson. At this time only 16 patients were available for observation and their condi-

tions may be summarized as unchanged in 8, and improved in 8, but arrested in none.

To recapitulate, with originally 77 patients suffering from uncomplicated trachoma, the prescribed course of treatment with sulfanilamide was carried out. At the end of the treatment only 8 cases were asymptomatic, 40 had improved definitely, and 29 were in approximately the same status. After an interval of five to six months after cessation of sulfanilamide it was possible to reexamine only 22 of the patients under study. At that time 14 of this number were unchanged from their original status, and 8 manifested varying degrees of clinical improvement.

Effect on Trachoma Complicated with Secondary Infection. The patients classified in this group were 23 in number, all Navahos treated in the Indian Service Hospital at Fort Defiance, Arizona. They were all suffering from trachoma of varying intensity, but in each instance the condition was aggravated by the presence of secondary infection, more or less acute in character, with two of the patients, in fact, yielding gonococcus from the conjunctiva. The effect of sulfanilamide on the acute condition was rapid and conclusive; photophobia, exudate, and chemosis of the lids were eliminated usually within a week or 10 days. The general appearance of the eye became vastly improved and visual acuity increased, but the trachomatous process in each case was still active. Thus, of the 23 patients, trachoma was improved in 8, unchanged in 15, and arrested in none. In addition to the sulfanilamide, local treatment was given, with such medication as argyrol (25 percent), atropine (1 percent), silver nitrate (2 percent), copper sulphate (2.5 percent), chaulmoogra oil, and other medicaments, the choice of agent depending upon the clin-

ical indications. It is only fair to add that 15 of the patients received sulfanilamide from 7 to 14 days only, while 4 took the drug in the prescribed quantity, and 4 others in excess, even as long as for 38 days. The duration of treatment was frequently reduced in this group, either because of toxic manifestations to the drug, desertion by the patient, or failure of the trachomatous process to respond satisfactorily. In any case, the conclusion seems justified that secondary infection was eradicated rapidly by sulfanilamide and that trachoma, while less active, was not arrested at the end of the treatment even when this was carried on considerably longer than prescribed.

It is interesting in this connection to include a patient under observation at the University Clinic. With one eye characterized by an old inactive process, and the other markedly inflamed with excessive purulent discharge, papillary lids, and extensive disease of the cornea including infiltration and generalized pannus, the case was considered aggravated by secondary infection. Accordingly the patient was placed on sulfanilamide in the recommended dosage for one week, which caused regression of the acute symptoms and a disappearance of both the bacteria and epithelial-cell inclusions originally present. His treatment was then continued with injections of tartar emetic,^{4, 5} when the trachomatous condition was rendered inactive.

Effect on "Flare-up" Trachoma. Although in universal usage, the expression "flare-up" as applied to trachoma is rarely defined. While it sometimes connotes a definite clinical picture, there is a certain vagueness regarding its true meaning. To the writers, the term implies a sudden, explosive return of a condition clinically quiescent for months or years previously. As examples, two

patients immediately come to mind, both treated at the University Clinics as subjects in this group. One had been treated almost a year previously with tartar emetic and had been released as asymptomatic following the routine course.^{5, 6} His subsequent admission was as an otolaryngological patient requiring a submucous resection. The day before the operation his eyes were examined and found to be completely without symptoms. The lids were smooth and pale, capillaries were quite evident, and there were delicate streaks of scar tissue; the corneae were of normal transparency and no vessels were grossly visible. Several days following the operation the patient complained of a retropharyngeal abscess and was given sulfanilamide for this condition. The patient was seen again by request two days later, when there was copious secretion, the lids were swollen, and the general appearance was acute and inflamed; there was a scattering of follicles on the lids and along the limbus; the corneae were clouded and invaded by a well-developed pannus. The second patient, apparently asymptomatic over a period of nine months, developed a severe cold, during which a fulminating trachoma, particularly of the cornea, rapidly returned. The two examples submitted indicate that while the virus may perhaps remain in abeyance in tissues clinically quiescent, a nonspecific stimulation, such as unrelated infection, may precipitate a condition clinically disproportionate to the rate of its appearance. The factors of nonspecific irritation and time, perhaps more than any other, distinguish "flare-up" trachoma from other forms of relapse or genuine reinfection.

This variety of trachoma, then, was represented by 18 patients, 13 Navahos treated at Fort Wingate, New Mexico, and 5 whites at the Washington University Clinic. These individuals were started

on sulfanilamide in the usual manner, but none required the full course of treatment. Improvement was prompt, the condition in the lids becoming arrested in 10 to 20 days. The corneae were markedly improved, infiltration disappeared and while about half still showed large capillaries, the infection was considered inactive. Thus, in contrast to the patients described above with primary uncomplicated disease, the effect of the drug appears to be rapid and conclusive.

TOXIC REACTIONS TO SULFANILAMIDE

Current medical literature is replete with the various toxic manifestations induced by sulfanilamide. The toxicity is protean and unpredictable both as to its expression and its occurrence: It may be a mild reaction or extremely severe, actually sufficient to cause death, as, in fact, the writers saw in two instances, fortunately not among their own patients, when the drug induced a malignant leucopenia. It was, therefore, important that a careful watch be kept in order to detect as soon as possible the appearance of toxic reaction, thus allowing early adoption of counteracting measures. For the sake of brevity, the different toxic manifestations observed have been summarized in table 1. The patients have been divided into the groups already described above. Since only 8 of the 23 patients with secondary infection received treatment equal to or in excess of the specified dosage, it seems only fair to exclude from this tabulation the remainder of the group. Analysis of the data indicates that 98 individuals were studied for toxic reactions. Hyperpyrexia was the most common clinical symptom (12 patients), usually representing an elevation of 2 or 3°F. and occurring from 9 to 15 days after commencement of treatment. Upon withdrawal of sulfanilamide, the temperature was restored to

TABLE 1
DISTRIBUTION OF TOXIC MANIFESTATIONS OF SULFANILAMIDE

Variety of Trachoma	Number of Patients	Number of Patients Observed with					
		Fever	Headache	Rash	Cyanosis	Vertigo	Gastric pain
Uncomplicated							
Series 1	24	7	2	3	2	1	none
Series 2	24	none	4	1	none	none	1
Series 3	29	5	1	1	none	none	none
With secondary infection	8	none	none	none	none	none	none
"Flare-up"	13	none	4	none	none	1	none
Totals	98	12	11	5	2	2	1

normal, never requiring more than three days. Headache was the next most common complaint, occurring 11 times. This complication was of minor importance and was dissipated by discontinuation of the drug. A rash not unlike that seen in measles was encountered in five individuals appearing from 11 to 15 days after treatment was begun, with or without elevation of temperature. Again with immediate cessation of the drug this reaction subsided in one to three days. In addition, cyanosis occurred in 2 patients, dizziness in 2, and gastritis in 1, all promptly controlled by withholding further treatment.

It was not feasible to repeat blood examinations as frequently as desired, because many individuals (that is, in the group of secondary infection and "flare-up") were not carried sufficiently long on sulfanilamide, and other patients were not present at the time examinations were scheduled. In 35 individuals, however, it was possible to determine the occurrence of hematological variations attributable to sulfanilamide by study of the blood elements at least twice a week over the prescribed period of treatment. The data obtained from these patients are summarized in table 2. It will be seen that 25 patients showed no significant alterations in hemoglobin, or in the number

of red blood cells. The changes observed in the remaining 10, while definite, were not considered of sufficient danger to warrant interruption of the treatment, although demanding greater alertness to avoid serious anemia. In the case of the white blood cells, 27 patients remained approximately normal and 8 gave distinct evidence of varying degrees of leucopenia with corresponding neutropenia. Of these 8, the condition became sufficiently marked in 3, so that treatment was discontinued before the reaction became alarming. The rule was followed scrupulously of abandoning sulfanilamide when the white cells reached a count of 3,000 per c.mm. Whether this number actually provides a sufficient margin of safety cannot be answered by the observation of the three examples encountered in this study.

The evidence indicates clearly that toxic reactions may occur frequently with the use of sulfanilamide. While

TABLE 2
FREQUENCY OF HEMATOLOGICAL CHANGES DURING TREATMENT WITH SULFANILAMIDE

Total number of patients observed	35
Number with depression in Hb.	10
Number with decrease in red cells	10
Number with decrease in white cells	8
Number with neutropenia	8

most of the manifestations are readily detected and of no great significance, others, as anemia and leucopenia, are more serious. It seems to the writers, however, that the danger from sulfanilamide is not in its potential toxicity, but rather in the negligence of the physician in charge. Ample warning of toxic reactions is usually provided by clinical alertness and frequent examinations of the blood, so that when the first signs of toxicity appear, the drug can and should be withdrawn immediately, thus checking further destructive action.

DISCUSSION

That the treatment of trachoma has not yet attained a satisfactory state is evident from the frequent and numerous reports either modifying older methods or devising new procedures and preparations. While local application of metallic salts (silver, copper, and zinc) or grating have long been established as perhaps the most reliable of the choices available, they nevertheless have their limitations, since such treatments are prolonged, painful, and scar-producing, and their end result is uncertain, as frequent recurrences attest. The introduction of sulfanilamide or its derivatives as new therapeutic agents for trachoma is a recent example of the efforts continually made to perfect the treatment of this disease. The marked success achieved with this drug among the Indians⁴ prompted the present study to determine the effectiveness of sulfanilamide in trachoma.

A review of the collateral literature to date indicates a lack of unanimity on the action of sulfanilamide and related compounds in trachoma. The first report by Heinemann¹ while indicating successful treatment, is inadequate for analysis. One patient was treated with septacine, a benzyl derivative, and two with sulfanila-

midide, but there is no information supplied regarding dosage, duration of treatment, character of the disease, supplementary measures, and other data. The next published studies (by Lian² and Dik³ indicate that sulfanilamide does not cause healing by itself, but, supplemented with local chemical or mechanical measures, it becomes an effective agent. Loc,⁴ Gradle,⁷ Kirk, McKelvie, and Hussein,⁸ and most recently Richards, Forster, and Thygeson⁹ have been greatly impressed by the curative effect of sulfanilamide. The latter workers observed the disappearance of inclusion bodies during treatment, and the inability of pooled tissues obtained from patients after 29 days under sulfanilamide to infect baboons, although there is no statement to indicate the infectivity of the tissues before treatment or the susceptibility of the animals. Applying a glucose derivative by subconjunctival injection, Burnet, Cuénod, and Nataf¹⁰ concluded that this compound is more effective on the corneal than on the conjunctival disease.

Several other investigators take a somewhat intermediate position on the value of sulfanilamide in trachoma. While they acknowledge a certain measure of improvement and occasionally even recovery following the use of the drug, they hesitate to ascribe to it the degree of recuperative powers observed by the foregoing workers. These investigators are Hirschfelder,¹¹ Sedlacek and White,¹² Lane,¹² Spining,¹³ and Trowbridge.¹³

Wilson,¹⁴ on the other hand, treated with prontosil rubrum 10 children with primary trachoma, characterized by well-marked conjunctival lesions and minor corneal involvement (pannus tenuis and no active keratitis). He concluded that the drug had no effect upon the disease.

The data derived from this study impose upon the present writers a less sanguine attitude regarding the ap-

praisal of sulfanilamide. Sifting the results as described above, they may be summarized fairly (see table 3) as follows: in uncomplicated trachoma, improvement measured by numerical reduction, flattening, and blanching of follicles is common, but genuine recovery is infrequent; in concurrent conjunctival infection, the secondary condition is eliminated, and the trachomatous process may be improved, but its arrest is

the disappearance of epithelial-cell inclusions in the small number of patients (six) studied for the purpose remains doubtful in the writers' minds. The opinion formed from past experience is that inclusion bodies disappear automatically with the duration of the disease, that trachoma may be active and infectious for monkeys in their absence, and that mild treatment or repeated scraping of the conjunctiva frequently causes their

TABLE 3

SUMMARY OF OBSERVATIONS ON TREATMENT OF TRACHOMA WITH SULFANILAMIDE

Variety of Trachoma	Number of Patients	Clinical Condition Following Treatment ¹		
		Unchanged	Improved	Arrested
Uncomplicated				
Series 1	24	3	17	4
Series 2	24 ²	2	19	3
Series 3	29 ³	24	4	1
With secondary infection	23 ⁴	15	8	none
"Flare-up"	13	none	none	13
Totals	113	44	48	21

¹ See text for greater details.

² The results indicated represent condition 1 month after treatment.

³ Of these patients, 18 examined 3 months after treatment showed: unchanged 3, improved 14, arrested 1. At the end of 5 months, 16 patients remained, 8 were unchanged and 8 improved.

⁴ Only 8 of this group received the full treatment or more, but not the same 8 indicated under improved; secondary infection was eradicated promptly in all.

rare; in the exacerbative form, the effect of sulfanilamide is most striking, inducing complete regression of symptoms. In broad totals, irrespective of the classification devised in this study for convenience, trachoma was rendered asymptomatic in roughly 20 per cent of the patients, improved in about 40 percent, and unchanged in about 40 percent. It seems, therefore, that a large number of patients are improved but since they still remain clinically active they cannot be considered as arrested or asymptomatic. In other words, fuller treatment is required, and to this extent the results of Lian and Dik are confirmed by this study.

How much emphasis is to be laid upon

evanescence. In other words, the mere absence of inclusions in a symptomatic conjunctiva cannot be interpreted infallibly in terms of clinical activity. So, as a matter of fact, only one of these six patients became asymptomatic, even though inclusions had disappeared in all. In the absence of clinical symptoms, on the other hand, the evidence for recovery appears to the writers to be self-sufficient.

Since going to press, two statements on the use of sulfanilamide have come to our attention. Busacca¹⁵ states, "... in cases of trachoma and acute conjunctival catarrh, results obtained with sulfanilamide did not justify its further use."

Burnier¹⁶ treated with this drug 15 patients with types II and III trachoma, but in conjunction with some other form of local treatment. Of these 3 were "apparently cured," one of whom received grattage and then silver nitrate simultaneously; 9 were improved (some had secondary infection), and 3 were unchanged.

CONCLUSIONS

1. Sulfanilamide administered in trachoma as described caused varying degrees of improvement in about 40 percent of the patients studied, and recovery

in about 20 percent, without affecting the remainder.

2. The drug has a marked and rapid effect on the secondary infections commonly associated with trachoma.

3. The most striking results were observed in patients with exacerbative disease.

4. In a small number of patients studied (six), epithelial-cell inclusions disappeared during the course of treatment.

5. Sulfanilamide induces a variety of toxic manifestations, which need not be dangerous if care and judgment are exercised.

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LARVAL CONJUNCTIVITIS*

REPORT OF A CASE DUE TO OESTRUS OVIS

HAROLD R. SNIDERMAN, M.D.

Cincinnati, Ohio

Ocular myiasis due to the larva of the sheep gadfly is probably more frequent than a review of the literature indicates. Only five cases have been reported in the American literature, probably because the consequences are known not to be serious, or cases have been missed. Many have been reported in the French and Russian literature.

Stark,¹ Schenck,² Bedsdale and Neal,³ Lyon,⁴ and Mustard⁵ describe an accidental eye infestation, with no serious ocular effects resulting.

The larvae found in all of the reported cases were similar. In none were the larvae reared to the adult fly stage, which it is not always possible to do. Thus in many cases of human myiasis the causative agent remains doubtful.

J. A. Portchinsky⁶ first described the *Oestrus ovis*, its history, characteristics, methods of control, and relation to man.

The *Oestrus ovis* is the larva of the common sheep gadfly, which in its early larval stage, the stage found in the cases reported, reaches a size of about 1 mm. in length. It is oval in shape, broader in front than in the rear, with dark, well-developed hooks placed anteriorly. It is actively motile and uses its hooks for attachment to the mucous membrane.

The sheep gadfly is of interest in that it deposits its young while flying. It dashes into the eye or ear, deposits its larvae, and is away in a fraction of a second. It is one of the few flies that lay living larvae and not eggs.

During the summer or autumn the larvae, usually 5 to 50 at a time, are



Fig. 1 (Sniderman). Photomicrograph of *Oestrus ovis*; actual size 1 mm.**

** The photograph was made by Mr. J. B. Homan.

*From the Department of Ophthalmology, Cincinnati General Hospital. Case reported before the Cincinnati Ophthalmology Society, October, 1938.

deposited by the female flies into the eyes or nose of the sheep. The larvae pass into the sinuses, and during the winter grow into maggots that are 20 to 30 mm. in length. In the spring these maggots fall out of the nose onto the ground where they pupate in three to six weeks into the adult fly. This development has never been reported in man.

Larval conjunctivitis due to other fly larvae is met most commonly in Eastern Europe, Central America, and in the tropics. It may appear as conditions of varying seriousness, from the mildest, in which signs of irritation of the conjunctiva are found, to one in which a complete destruction of the eyeball by maggots is discovered. Its incidence is favored in humans by close association with infested animals and in living conditions of filth and squalor.

In all cases due to *Oestrus ovis* reported, the patients complained of itching, excessive lacrimation, and the usual signs of a mild conjunctivitis. Unless a careful examination is made, the causative factor may be missed. In the case to be reported, the patient insisted that there was something moving about in his eye, and only after examination with a binocular loupe were the larvae seen swimming about deeply in the folds of the conjunctival fornix. They might easily have been missed, hidden as they were in the folds. None was seen on the bulbar conjunctiva or on the cornea.

Case report. E. G., a white male, aged 42 years, a junk dealer, while working felt something hit his left eye. Five hours later he presented himself complaining of burning, excessive lacrimation, and "something in the eye."

Examination of the left eye revealed a superficial congestion of tarsal and bulbar conjunctiva. No foreign body was

found. The cornea did not stain with fluorescein. The patient insisted that there was something in his eye and examination with a binocular loupe showed small wormlike organisms in the lower fornix. An attempt to wash them out of the sac was unsuccessful. Local anesthesia was instilled into the eye, and the organisms, hooked into the conjunctiva, were with difficulty removed by a cotton applicator. Fifteen of these larvae were removed at this time. They were about 1 mm. long. The microscopic appearance is seen in the photomicrograph.

A conjunctival smear at this time had only a few epithelial cells. There were no pus cells, bacteria, or eosinophiles. A white blood count and differential count was normal.

The conjunctiva was treated with a 2-percent solution of silver nitrate, and the patient given an antiseptic collyrium for home use.

On the second day the conjunctiva was moderately injected and edematous. Two more larvae were picked out of the conjunctival sac. This time they were inactive and easily removed.

On the third day the patient showed a slight morning agglutination of the lids. No larvae were found. By the sixth day the injection of the conjunctiva had cleared up and the patient was discharged.

One month later an ocular examination revealed nothing abnormal.

This case is reported because of its unusual nature and because the diagnosis might easily have been missed. It also emphasizes the importance of an examination of the eye under magnification, when the patient complains of a sensation as of a foreign body in the eye.

Cincinnati General Hospital.

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STREPTOCOCCIC PSEUDOMEMBRANOUS CONJUNCTIVITIS
TREATED WITH SULFANILAMIDE*

KENNETH C. SWAN, M.D. AND JAMES H. ALLEN, M.D.
Iowa City, Iowa

Streptococcic pseudomembranous conjunctivitis may be acute or chronic. The chronic type of the disease may show exacerbations and remissions and therefore occasionally has been referred to as recurrent pseudomembranous conjunctivitis. Streptococci producing the beta (clear) type of hemolysis on blood agar may be isolated in pure culture or in association with other pathogenic bacteria. Specific passive immune therapy has been reported favorably by Kleuver¹ but these infections do not yield readily to the usual local treatment of conjunctivitis and often result in serious loss of vision. Systemic symptoms are common, and occasionally life may be endangered.

Three cases of streptococcic pseudomembranous conjunctivitis treated with sulfanilamide are reported. Each case represents a clinical type. Sulfanilamide administration to the first patient was begun in May, 1937, as a last resort to save the vision of a girl who had lost one eye in a previous attack of the disease. The encouraging results led to the use of the drug in the other patients.

Case 1. The previous history of this patient, A. B., a 12-year-old girl, has been reported by Rutherford² and Kleuver.¹ The patient developed a severe unilateral pseudomembranous conjunctivitis which resulted in loss of the left eye¹ in 1932. Following removal of the globe a granuloma developed which persisted and was covered with pseudomembranes in each exacerbation of the disease. Five weeks after the enucleation of the left eye, the disease involved the right eye in association with acute glomerulonephritis. Streptococci were isolated periodically from the conjunctival sac. The condition progressed in spite of local measures including radiation therapy. Finally improvement resulted following the administration of scarlet-fever streptococcic antitoxin.¹ Active immunization with autogenous vaccine was attempted; however, the pseudomembranes recurred early in 1935. The inflammation was controlled by further administration of antitoxin and remained stationary for two years. In March, 1937, the patient developed an acute dacryocystitis on the right side which was treated successfully with irrigations and antitoxin. Active immunization with Dick scarlet-fever toxin was undertaken. In May, 1937, a

* From the Department of Ophthalmology, College of Medicine, State University of Iowa. Part of a study being conducted under a grant from the Proctor Fund.

pseudomembrane reformed over the upper palpebral conjunctiva of the right eye. Scarlet-fever antitoxin was administered daily for two weeks, but the inflammation progressed. Oral sulfanilamide therapy (0.5 gr. per pound of body weight per day) was instituted. Three days later improvement became evident

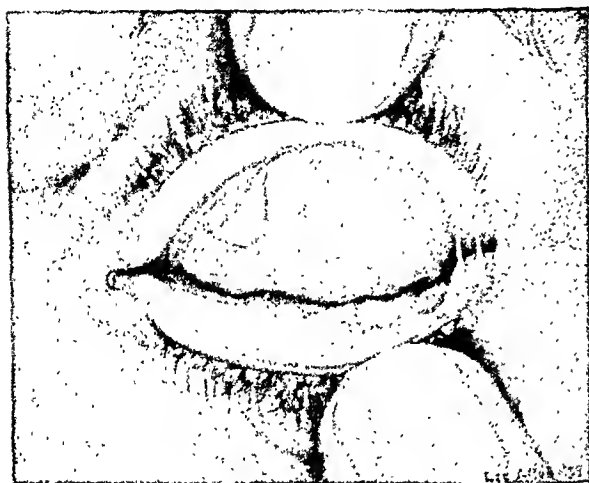


Fig. 1 (Swan and Allen). Appearance of pseudomembranes in case 2 on admission.

and in 10 days all activity had subsided. The patient was advised to continue taking the same dosage of the drug at home, but did not do so regularly. On December 28, 1937, a pseudomembrane again appeared on the conjunctiva of the right upper lid, but the inflammatory reaction was less severe than in previous exacerbations. The patient remained in the hospital for two weeks in January, receiving the same dosage of sulfanilamide as on the previous admission. At the time of discharge, there was no evidence of active inflammation, and cultures remained negative. The patient has continued to take sulfanilamide (one-third grain per pound of body weight per day) for more than a year. There have been no toxic manifestations from the drug nor evidences of recurrence of the disease.

Case 2. G. S., an eight-months-old girl with an inflammation of the left eye, was

admitted to the Eye Service of the University Hospitals on September 13, 1938.

In April, streptococci had been isolated from the baby's throat during the course of a severe upper respiratory infection.** Concurrently the infant had developed impetigo contagiosa, which had persisted.

On September 3, 1938, the left eye became reddened. Within 48 hours, the lids were swollen shut, and the margins were covered with a thick yellow discharge. The referring physician** reported that pseudomembranes developed on the third day, covering the conjunctiva of the upper lid. During the week before hospitalization, the swelling extended and involved the side of the infant's face. The discharge became increasingly profuse in spite of irrigations and local antiseptics.

Physical examination: On admission, the infant was pale and restless. Several of the typical flat erosions of impetigo contagiosa were present on the face. Otherwise general physical examination was negative.

The left cheek and eyelids were red and swollen. There was a seropurulent discharge which coagulated to form flat, yellow crusts on the cheek and along the lash line. The conjunctiva of the left eye was hyperemic, dull, and thickened. The fornices and plica semilunaris were edematous. A thin, grayish pseudomembrane was present over the tarsal plate of the upper lid (fig. 1). It was removed from the conjunctiva in one piece, leaving a few bleeding points. Small islands of pseudomembrane were present over the conjunctiva of the lower lid. These pseudomembranes re-formed in four to six hours after removal. Two-percent fluorescein produced superficial punctate staining of the cornea and patchy staining of the conjunctiva where pseudo-

** By Dr. H. C. Kleuver, Fort Dodge, Iowa.

membranes had been removed. The right eye did not show evidence of inflammation.

Laboratory: Smears of the discharge revealed large numbers of gram-positive cocci in pairs and short chains associated with masses of polymorphonuclear leucocytes.

Cultures were taken from the conjunctival sac. On blood agar, small semi-opaque colonies surrounded by zones of

grains per pound of body weight per day was prescribed, but because of frequent regurgitations and difficulty in feedings, the infant did not receive this full amount. Thirty-six hours later the discharge had decreased, no new pseudomembranes had formed, and cultures were negative. On the fourth day edema was negligible. Nine days after the beginning of treatment the only persisting sign of inflammation was slight hyper-

TABLE 1
TREATMENT AND COURSE IN CASE 2.

Date	Sulfanilamide		Cultures for Streptococci	Clinical Course		Total red cell count	Hb in grams	Total white cell count	Neutrophils in white cell count
	Grains per lb. body wt. per day	Blood conc. in mgs. 100 c.c. blood		Pseudomembranes	Purulent discharge				
8/14/38	3	—	+	Re-formed 4-6 hours after removal	Profuse			26,250	68%
8/15/38	1½	—	+	Re-formed during night	Profuse	5,200,000	11.0	24,250	65%
8/16/38	1½	2.9	0	Absent	Moderate			22,150	49%
8/17/38	1½	—	0	Absent	Slight			15,800	52%
8/18/38	1½	2.9	0	Absent	Slight			21,400	36%
8/19/38	1½	—	0	Absent	Absent	4,900,000		21,150	38%
8/20/38	1½	2.8	0	Absent	Absent				
8/21/38	1½	—	0	Absent	Absent				
8/22/38	1½	—	0	Absent	Absent	5,100,000	10.6	16,400	40%
8/23/38	1	3.0	0	Absent	Absent				
10/25/38	1		0	Absent	Absent	5,100,000	10.5	14,300	36%

clear hemolysis were present 24 to 48 hours after incubation at 37°C. These organisms were not bile soluble and did not ferment inulin. In broth cultures, the organisms formed a flocculent sediment, smears from which revealed chains of gram-positive cocci.

Microscopically the pseudomembranes were found to consist of a fibrin network containing degenerated epithelial cells and leucocytes.

Urinalysis was negative. Hematologic studies are included in table 1.

Diagnosis: Acute pseudomembranous conjunctivitis due to beta hemolytic streptococci. Impetigo contagiosa.

Treatment and course: On September 14, 1938, sulfanilamide therapy was instituted by placing crushed tablets in the infant's formula. One-and-one-third

emia of the lid margins and conjunctiva. The course of the disease and the laboratory control of therapy are shown in table 1.

Case 3. G. S., a 47-year-old white female, noticed a foreign-body sensation in her right eye on the afternoon of November 2, 1938. On the following day this symptom was accompanied by photophobia and lacrimation. On November 4 a physician was consulted who cauterized a small corneal ulcer, instilled a mydriatic, and administered a foreign protein. The patient was subjectively improved, but on November 8th the eye began to ache, the lids became swollen, and a yellow discharge appeared. There were systemic symptoms including anorexia, weakness, and fever. The inflammation was treated in a local hospital with warm

compresses and irrigations. The discharge became thick and increasingly profuse, and on November 13th, the swelling spread to the right cheek. Three days later, as no improvement was evident, the patient was transferred to the University Hospitals.



Fig. 2 (Swan and Allen). Crusting and swelling of lids and cheek in case 3.

Past ocular history revealed that even with glasses her visual acuity had always been poor and seemed to be failing in recent years.

The patient had had frequent upper respiratory infections and attacks of redness, pain, and swelling of her joints each winter since 1930.

Physical examination: General examination revealed a pale, listless, poorly nourished, middle-aged arthritic, white female, with many loose and broken teeth, and a small erosion of the cervix uteri. Oral temperature was 99.8°F.

Examination of the right eye revealed a visual acuity of 1/200 which could not be improved. A red, encrusted swelling involved the eyelids and upper half of the right cheek (fig. 2). Hyperemia at the periphery of the lesion suggested an advancing border. A thick, yellow discharge was present along the lid margins. The conjunctiva was diffusely red,

dull, and thickened. A gray tenacious pseudomembrane was removed intact from the conjunctiva of the upper tarsal plate, leaving multiple bleeding points. Corneal sensitivity was slightly diminished. An active pannus, most prominent superiorly, extended almost to the pupillary area. Small gray infiltrations were present in the anterior corneal stroma just within the limbus. Punctate superficial staining of the epithelium of the entire cornea was evident after the instillation of one drop of 2-percent fluorescein. Tyndall's phenomenon was present and a few circulating "floaters" were observed in the anterior chamber. The iris appeared normal. The pannus and a dense central posterior subcapsular cataract prevented satisfactory fundus examination. The intraocular tension was normal. The right preauricular node was enlarged and tender.

There was no inflammation of the left eye. Visual acuity was 3/200 but could be improved to 10/200. Visual impairment was attributed to a posterior subcapsular cataract and myopic degeneration of the retina.

Laboratory examination: Beta hemolytic streptococci were cultured from the conjunctiva of the right eye. These organisms had the same morphological and biochemical characteristics as those isolated from the patient in the second case. In addition many colonies of hemolytic *Staphylococcus aureus* were present.

Giemsa and Gram stains were made of secretion smears and of scrapings from the lower palpebral conjunctiva. Numerous polymorphonuclear neutrophilic leucocytes and a few eosinophilic leucocytes were found. The epithelial cells showed no evidence of inclusion bodies. There were many Gram-positive intra- and extracellular cocci. In hematoxylin-and-eosin stained sections (fig. 3) the membranes were seen to be composed of

a fibrin network in which polymorphonuclear leucocytes and the superficial layers of the epithelium were enmeshed. Necrosis of the enmeshed epithelial cells was evidenced by cloudiness of the cytoplasm and pale-staining nuclei.

The blood Wassermann test was negative, other hematologic studies are included in table 2; urinalysis was negative.

Roentgenograms revealed clouding of the right maxillary, frontal, and ethmoid sinuses.

Diagnosis: The primary diagnosis was acute pseudomembranous conjunctivitis of the right eye complicated by keratitis and cellulitis of the cheek due to a mixed streptococcic and staphylococcic infection. Secondary ocular diagnoses were high myopia with degenerative changes in the retina and bilateral posterior subcapsular cataracts.

Other diagnoses were secondary anemia, pyorrhea alveolaris, chronic sinusitis, endocervicitis, and atrophic arthritis.

Treatment and course: The treatment of this patient is given in detail in table 2. Oral administration of sulfanilamide was instituted on November 17, 1938. Improvement became manifest on November 19th by decrease in both discharge and swelling and by the failure of the pseudomembranes to re-form after removal. There was no growth of streptococci, although numerous colonies of staphylococci were present in the cultures for two more days. The amount of discharge and hyperemia was negligible after the fourth day of treatment, although a few colonies of staphylococci were evident in the daily cultures until the ninth day. The disappearance of staphylococci followed the institution of

local antiseptic therapy to the conjunctival sac.

The course of treatment was complicated by an anemia which was present on admission and which gradually progressed during the period of sulfanilamide administration. The drug



Fig. 3 (Swan and Allen). Section of pseudo-membrane showing polymorphonuclear leucocytes and epithelial cells enmeshed in fibrin network.

was discontinued when a mild leucopenia became evident. The anemia was treated by blood transfusion and reduced iron by mouth, with an uneventful recovery.

DISCUSSION

Three cases of streptococcic pseudomembranous conjunctivitis were treated with sulfanilamide. All were serious infections that were progressing despite other forms of treatment. The first patient had lost an eye in a previous attack of the disease and attempts to build up specific active immunity had not been successful. The three patients represented different age groups and different types of the disease, but their clinical courses after institution of sulfanilamide therapy were similar. Signs of clinical improvement were evident after two to three days of treatment. There was a decrease in the amount of discharge, pseudomembranes did not re-form after removal, and cultures did not reveal the

TABLE 2
TREATMENT AND COURSE IN CASE 3

Date	Sulfanilamide		Cultures		Clinical Course			Hematology				Remarks
	Grains per lb. Body wt. per Day	Blood Conc. in mg. per 100 c.c.	Colonies of Streptococci	Colonies of Staphylococci	Pseudo-membranes	Amount of Discharge	Hyperemia and Edema	Hemoglobin in Grams	Total Red Cell Count	Total White Cell Count	Neutrophils in White Cell Count percent	
1938												
11-16	0		Many	Many	Present	++++	++++	9.3	3,980,000	9,850	78	Sodium bicarbonate gr. V t.i.d. High caloric diet Cold compresses to cheek Able to open lids
17		5.5	Many	Many	Present	++++	++++					
18			Few	Many	Present	++++	++++					
19			0	Many	Did not re-form	++	++					
20		7.5	0	Few	Absent	+	+					
21			0	2	0	+	+				60	
22		5.1	0	0	0	+	+					
23			0	1	0	+	+					
24	0	6.1	0	1	0	+	+					Zephiran 1:2500 aqueous solution Gtts. i t.i.d. to O.D.
25	0		0	2	0	0	0				65	Slight pseudoptosis only persisting sign White petrolatum to cheek cold compresses stopped
26		3.5	0	0	0	0	0					
27			0	0	0	0	0					
28		5.7	0	0	0	0	0	8.0				
29			0	0	0	0	0	7.45				
30			0	0	0	0	0					
12-1		3.2			0	0	0	8.5	2,470,000	3,750	62	Extraction of teeth. Reticulocyte count 0.2% Rt. antrum irrigated
2					0	0	0					
3		Trace			0	0	0	8.5	2,540,000	4,750	41	
4					0	0	0					
7					0	0	0					
8			0	0	0	0	0	11.5	2,580,000	6,700		Reduced iron gr. V t.i.d. Reticulocyte count 13%
9					0	0	0	12.0	3,390,000	7,400		600 c.c. blood transfusion Reticulocyte count 9%
2-11-'39					0	0	0	11.5	4,040,000	6,100		
					No Evidence of Inflammation							

presence of streptococci thereafter.

The first patient had a mild recurrence of the disease seven months after treatment with sulfanilamide. This recurrence was controlled by further administration of the drug.

The maximum dosage of sulfanilamide (two-thirds grain per pound of body weight per day) administered to two of these patients was the minimum usually advocated in treatment of systemic infections. The blood concentration of sulfanilamide in the third patient was maintained at only 3 mg. per 100 c.c. of blood. The drug was administered in

spaced doses and blood samples for analysis were drawn two hours after the late afternoon dose in order to determine the maximum concentration. The fluid intake was controlled to prevent excessive excretion or retention of the drug. Sodium bicarbonate was prescribed as a precaution against acidosis.

CONCLUSION

The oral administration of small doses of sulfanilamide was effective in the treatment of three cases of streptococcic pseudomembranous conjunctivitis. Further clinical trial is indicated.

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CONGENITAL SECONDARY GLAUCOMA*

REPORT OF TWO CASES SYPHILITIC IN ORIGIN

ALTON V. HALLUM, M.D.

Atlanta, Georgia

Congenital (infantile) secondary glaucoma is exceedingly rare, as stated by Ida Mann,¹ and she considers the increase in intraocular tension to be due to blocking of the pupil by adhesions between the iris and the lens. Fetal iritis occasionally develops a complete annular synechia, there is iris bombé with shallow anterior chamber, the tension rises, and the eye enlarges. Duke-Elder² intimates that inflammatory cells might block the drainage channels as in secondary glaucoma in adults. In such cases the uveitis, cyclitis, or choroiditis may have been prenatal.

DIFFERENTIAL DIAGNOSIS

Congenital (infantile) primary glaucoma, buphthalmos, or hydrophthalmos, occurs fairly frequently, resembles glaucoma simplex in adults, and results from developmental abnormalities of the drainage mechanism in the iris angle. A. Fuchs³ suggests that the term buphthalmos be applied to congenital glaucoma where the iris is incorporated with the bulging cornea, and that the term hydrophthalmos include those cases in which the iris is not included in the bulging cornea. However, buphthalmos, from the Greek words meaning ox eye, is the term most often used. In this condition the sclera and cornea stretch from the increased intraocular tension and produce an enlarged globe. The cornea is often clear, but there may be lines or striae produced by ruptures in Descemet's membrane. However, if the tension is sufficiently high the cornea will be steamy. The anterior chamber

is usually deep, and the iris appears atrophic and may be tremulous from lack of contact with the lens. Heredity is considered to be an etiological factor. Buphthalmos is bilateral in about 80 per cent of cases, and blindness is the rule unless surgical filtration is established. However, many cases have become arrested spontaneously.⁴

Megalocornea is a bilateral developmental anomaly in which there is no increase in intraocular pressure, but the entire anterior segment of the globe is larger than normal. The cornea is clear and transparent, and its diameter may be from 13 to 14 mm. The anterior chamber is always deep, the vision is usually good, and the cause of the enlargement is considered to be a primary overgrowth.⁵

REPORT OF CASES

The following two cases of glaucoma in infants illustrate a very rare complication of congenital syphilis; and because it seems to be caused by syphilis, the glaucoma is considered to be secondary in character.

Case 1. A colored male, W. A. G., aged 2 months, was referred to the eye clinic of Grady Hospital from the pediatric clinic on February 11, 1937, where it had been noticed that each cornea of the baby was cloudy and lusterless. The parents had brought the baby to the pediatric clinic for routine management. The general physical findings indicated congenital syphilis, and the blood Wassermann test was positive. Both mother and father had taken antisyphilitic treatment two or three years previously, although the mother's blood Wassermann was negative early in this pregnancy. This baby repre-

* From the Departments of Ophthalmology and Pediatrics, Emory University School of Medicine. Read before the Atlanta Eye, Ear, Nose, and Throat Society, February 12, 1939.

sented the third pregnancy, was delivered at full term, but weighed only 2,225 grams (4.9 lbs.). The first pregnancy in 1934 resulted in abortion at 5 months, and the second pregnancy ended in abortion at 6 months. There was no consanguinity.

The cornea of each eye was uniformly cloudy, as in acute glaucoma, that of the right eye being the most opaque. No cells were seen on the posterior surface of the cornea nor in the aqueous. The diameter of each cornea was thought to be normal, but unfortunately an actual measurement was not made. The anterior chamber appeared to be of normal depth. The pupils were 3 or 4 mm. in diameter, and only the left pupil reacted sluggishly to light. A faint fundus reflex was seen through the pupil of the left eye only. The intraocular tension was 90 mm. Hg in the right eye and 40 mm. in the left eye, as estimated under local anesthesia with the old Schiötz tonometer.

The case was considered to be one of early congenital primary glaucoma, or buphthalmos. One-percent pilocarpine solution was ordered to be instilled in each eye three times daily, and a sclerocorneal trephining was thought to be indicated if the tension was not reduced by miotics. A week later, on February 17th, the eyes were essentially unchanged and the baby was admitted to the hospital for an operation on the right eye. The pediatric department advised postponing the operation until a few weeks of antiluetic treatment had been given, but we considered the intraocular tension to be too high to be tolerated longer without loss of vision; and, too, we were of the opinion that the syphilis was not the cause of the glaucoma but only a coincidental disease. Under ether anesthesia, a sclerocorneal trephining of Elliot with a peripheral iridectomy was performed at about the 11-o'clock position on the limbus, by the

resident surgeon. The postoperative recovery of the eyes was prompt and uneventful, except for a mild unexplained temperature for three days following the operation. The baby remained in the hospital for 10 days, during which time 1-percent atropine was instilled in the right eye once daily, and 1-percent pilocarpine was instilled in the left eye three times daily.

On February 25th, 90 mg. of sulpharsphenamine was given in the gluteal muscle, and the patient was dismissed from the hospital two days later, at which time the right eye showed only slight injection, the tension was normal as estimated by finger palpation, the cornea was clear, there was good filtration beneath the conjunctiva at the site of the operation, and the anterior chamber was of normal depth. The cornea of the left eye was slightly less steamy than on admission, and the intraocular tension was estimated to be one-plus by finger palpation. On the twelfth postoperative day all injection of the right globe had disappeared, and the intraocular tension was 24 mm. Hg in the right eye, and 28 mm. in the left eye. The left eye was normal externally. The baby received the second injection of sulpharsphenamine.

On the twenty-third postoperative day, when the third injection of sulpharsphenamine was given, both eyes appeared to be normal except for the trephining in the right eye. The baby received about 20 injections of arsenic and bismuth at varying intervals during the year following the operation, during which time the eyes remained normal.

The patient was next seen in the clinic approximately two years after the operation, and he was found to be a robust, well-developed, and well-nourished youngster. The external appearance of each eye was normal in every way, except for the presence of a small peripheral

iridectomy at the 11-o'clock position in the right eye. There was no subconjunctival filtration at the site of the trephination. The tension of each eye was normal, as estimated by finger palpation. The transverse diameter of each cornea was 11.5 mm., and the corneas were clear. The interior of each eye, including the discs, was normal in every respect.

Case 2. A three-weeks-old colored male, J. A. G., was also referred from the pediatric clinic of Grady Hospital to the eye clinic on February 21, 1938. The baby had been brought to the pediatric clinic for routine management, where it was observed by the pediatrician that the corneas were steamy and appeared to be slightly enlarged. There was no consanguinity, but both child and mother were known to be syphilitic. The intraocular tension of each eye was estimated as 4-plus by finger palpation. The corneas were equally and uniformly steamy, and appeared to be slightly increased in diameter, but an actual measurement of the diameters was not made. No cells were seen on the posterior surface of the cornea nor in the aqueous. The anterior chamber appeared to be of normal depth, the iris and pupils could be seen indistinctly, and the pupils were 2 or 3 mm. in diameter and reacted sluggishly to light. A fundus reflex could not be obtained.

The first case above reported was not recalled at this time, and again the diagnosis of congenital primary glaucoma, or buphthalmos, was made. One-percent pilocarpine solution was prescribed to be dropped in each eye morning, noon, and night, and 0.05 gm. of neoarsphenamine was given in the pediatric clinic. A trephining operation on one eye was advised to be performed on the next eye-surgery day one week later. However, when the baby returned for the operation, it was found that the corneas were much less steamy and that the intraocular tension

of each eye was much reduced. The prescription for pilocarpine had been lost, and no miotic had been used. Then the first case was recalled, and it was decided to postpone an operation and continue antiluetic treatment. An intramuscular injection of bismuth was given in the pediatric clinic, and a week later the corneas were clear, and the intraocular tension of each eye was estimated to be normal by finger palpation. The patient received about 10 more injections of anti-syphilitic treatment during the next seven months, during which time the eyes remained normal.

One year after the first visit, the child was seen in the home and found to be rather frail and slightly under weight, but otherwise well and playful. The external appearance of each eye and the fundi were normal. The intraocular tension of each eye was normal to finger palpation, and the horizontal diameter of each cornea was 11 mm.

REVIEW OF THE LITERATURE

Only one similar case was found in the recent literature. Marquezy and Tavenec⁶ reported bilateral glaucoma in a 22-months-old syphilitic child who also had left spasmodic hemiplegia, and whose spinal fluid gave a 4-plus Wassermann reaction. Antisyphilitic treatment and pilocarpine caused a rapid disappearance of the glaucoma. Four years later the eyes were normal, except that the discs were slightly pale. They quoted Mlle. Cordier who reported 12 cases of glaucoma in infants; only one was definitely luetic. She thought consanguinity might be a factor in nonluetic cases.

Beckh⁷ made a statistical study of the incidence of syphilis in a group of 365 cases of primary glaucoma, and concluded that primary glaucoma in adults was in no way related to syphilis. He quoted Seefelder, who studied 47 cases of glaucoma in persons whose eyes were abnor-

mal from birth, and concluded that congenital syphilis did not play a role in the pathogenesis of buphthalmos. Beckh concurred with this opinion, because of the 11 patients in his series who had buphthalmos, on whom serologic studies were made, only one (a 17-year-old white girl) gave a positive Wassermann, and none had any stigmata of congenital syphilis.

Hardesty⁸ reported a case of glaucoma in a 2-months-old baby, with a negative Wassermann reaction, in whose case he attributed an overactive thymus to be the cause of the glaucoma; he also reported a 1-year-old child, with a negative Wassermann reaction, in whom he thought the hypoactivity of the adrenals had caused the glaucoma. The first child's glaucoma disappeared promptly after X-ray therapy to the thymus gland, and the second cleared just as promptly when given one-eighth grain of ephedrine by mouth three times daily. The first patient was also given 1-percent pilocarpine in each eye twice daily, but the second did not receive a miotic. He reasoned that the hypoactivity of the adrenals in the second case was caused by an overactive thymus, and that by supplying the deficient ephedrine the overactive thymus was in turn suppressed. Hardesty also quoted Magitôt, who reported two cases of infantile glaucoma, in both of which operation for relief of the intraocular tension was followed by death a few hours later. Each case, he thought, suggested the so-called thymic death, that is, sudden death after a general anesthesia in an infant who had an overactive thymus.

COMMENT

One cannot with absolute certainty classify the glaucoma in these two cases. But when they were first seen there was very little injection of the globes, and in the absence of visible inflammatory cells in the anterior chamber it seemed logical to classify the glaucoma as primary in

nature; especially since the consensus of opinion of the various authorities on the subject was that syphilis does not play a part in causing buphthalmos. The last factor was largely responsible for not postponing the operation in the first case until after more antisyphilitic treatment had been administered, as advised by the pediatricians.

The relief of the glaucoma could not be attributed to the use of miotics, because the second patient, through an error of the mother, did not receive a miotic. But the dramatic relief of the glaucoma by antisyphilitic treatment seems to point conclusively to syphilis as the etiology of the glaucoma in these cases. It is a well-established fact that intraocular syphilis usually manifests itself chiefly as an inflammation of the uveal tract and casts off inflammatory cells. These cells often block the drainage channels sufficiently to produce a rise in intraocular tension. In these cases there was probably a low-grade cyclitis which did not throw off enough cells to be visible macroscopically in the anterior chamber, but sufficient to block the iris angle and produce increased intraocular tension. For these reasons the cases were classified as secondary glaucoma.

I wish to acknowledge assistance of the members of the staff of the department of ophthalmology of the Emory University Division of Grady Hospital, and especially of Drs. William H. Kiser, Jr., Joseph Yampolsky, and M. Hines Roberts of the department of pediatrics for their help in the treatment and study of these cases.

CONCLUSION

When an infant has glaucoma, syphilis should be suspected; and when syphilis is present, an intensive course of antisyphilitic treatment should be given before ocular surgery is considered.

487 Peachtree Street.

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RETINAL ANGIOSPASM*

A CASE REPORT

HELEN HOLT, M.D.

Chicago

Gradually failing vision over a period of two years had disturbed the patient, Miss D. R., a white woman aged 23 years. During the two months previous to her admission to the clinic the change had been particularly noticeable so that she was unable to carry on her work as a waitress. Associated frontal headaches had become very annoying but not incapacitating during the last two weeks of this period. A private physician made a tentative diagnosis of optic atrophy of unknown etiology and referred the patient to the Northwestern University Medical Clinics for consultation with Dr. Gifford.

On February 14, 1938, when she first reported to the Eye Clinic, her vision was R.E. 20/200 and Jaeger 7; L.E. 20/100 and Jaeger 4. A general examination in the preclinic department had revealed no abnormal findings and her blood pressure was 110/85. Her general appearance was that of a person in good health. The conjunctivae and corneae were normal. Muscle action in the nine

cardinal positions was normal and no phorias were elicited with the cover test. The pupils reacted promptly to light and in accommodation. Both discs were of normal pinkness and had distinct outlines. No abnormalities of the peripheral fundi could be detected. The peripheral fields, taken on a Ferree-Rand perimeter with a 3-mm. white target, were normal. The central fields, taken on a Bjerrum screen, were tubular in type. In the right eye, the field for the 3-mm. object was only 5 degrees and with the 5-mm. object 10 degrees, with a very small field temporal to the blind spot. Color perception in this eye was lost. In the left eye, the field with the 1.0-mm. object was 5 degrees and with the 2-mm. object, 10 degrees. Perception of the red 8-mm. object was limited to the macular area. Diagnosis was deferred until the refraction could be tested.

Two days later, February 16, 1938, refraction was tested under homatropine cycloplegia, and the findings were R.E. +2.75 D. sph. \approx 0.25 D. cyl. ax. 135°; L.E. +2.50 D. sph. \approx 0.25 D. cyl. ax. 120°. At the trial test the R.E. ac-

* From the Department of Ophthalmology, Northwestern University.

cepted +1.75 D. sph. and the left eye +1.50 D. sph. but the vision was ability to count fingers at three feet with the R.E. and 10/200 with the L.E. When the fundus was examined, a decided change from that of the two days previously was noted. The disc margins of the right eye were blurred on the nasal side and the entire disc was pinker than normal. The physiological cup was obliterated, but there was no elevation of the disc. The macular area was not swollen. The disc margin of the left eye was blurred, and the disc was slightly elevated. There was edema of the macula with formation of a faint star figure. A tentative diagnosis of neuromyelitis optica was made and the patient was immediately hospitalized.

A thorough physical examination, including a careful neurological study, disclosed nothing abnormal. During lumbar puncture the initial pressure was 120 mm. of mercury. Bilateral jugular pressure produced a rise to 230 mm. and release of pressure a steady fall to 130 mm. of mercury. The spinal fluid was clear, contained no cells, and gave negative Wassermann and Kahn reactions. The blood Wassermann and Kahn were negative. Sodium nitrite, gr. 1 three times a day, and vitamin B in large doses were prescribed. The patient was discharged from the hospital on March 1st, improved.

On her return to the clinic on March 7, 1938, her vision was R.E. 20/65 and Jaeger 7; L.E. 20/65 and Jaeger 4. The disc margins were still a little hazy, but the discs were of normal pinkness and the physiological cups had reappeared. No edema of either macula was noted, but a glistening reflex was obtained from both areas. Vasodilators and vitamin B were ordered continued.

On April 4, 1938, the patient felt that there was definite improvement, but objectively her vision was about the same:

R.E. 20/65 and Jaeger 6; L.E. 20/65 and Jaeger 5; using both eyes, Jaeger 3 with difficulty. The peripheral fields were normal. With the Bjerrum screen the central fields were found to have remained tubular, and larger test objects had to be used than those of two months previously. In the right eye the field was 5 degrees with both the 5-mm. and 8-mm. white targets and there was no color perception in any portion of the field. In the left eye it was 10 degrees with a 3-mm. white target and 5 degrees with a 1-mm. Red perception with a 5-mm. target was limited to the macular region. Central scotoma could not be plotted with the smallest test objects. The patient always insisted that she could see the target in all portions of the field.

The inconsistencies of the field findings confused the diagnosis. The normal peripheral fields did not fit in with a diagnosis of optic atrophy and the almost tubular fields were more characteristic of a functional disturbance than of an organic one. The diagnosis was still undetermined.

On April 11, 1938, the patient complained of feeling tired in spite of the fact that she was not working, was getting 10 to 12 hours of sleep per night, had an excellent appetite, and had been gaining weight. A general examination again revealed nothing abnormal. The blood count was red cells 4,600,000, hemoglobin 13.01 (Sahli) and white count 6,750. Her vision had improved to R.E. 20/65 and Jaeger 5; L.E. 20/65 and Jaeger 2. No abnormal fundus changes were observed.

On May 2, 1938, her vision was about the same, but the right fundus appeared hazy, due to a slight cloudiness of the vitreous. Slight edema was present around the macula. The peripheral fields, taken with a 3-mm. target, were normal. On the tangent screen the field of the

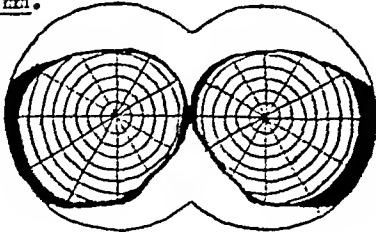
CASE REPORT: RETINAL ANGIOSPASMFebruary 14, 1938

R 20/200

L 20/100

L.E.

R.E.

 $\frac{3.0 \text{ mm.}}{330}$ 

L

R



2.0 mm. and 1.0 mm. white 5.0 mm. white
 1000 3.0 mm./1000 white
 8 mm. red No red perception

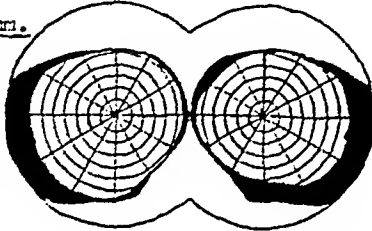
April 4, 1938

R 20/65 J 6

L 20/65 J 5

L.E.

R.E.

 $\frac{3.0 \text{ mm.}}{330}$ 

L

R



3.0 mm. and 1.0 mm. white 8.0 mm.
 1000 5.0 mm.
 5.0 mm. red No color

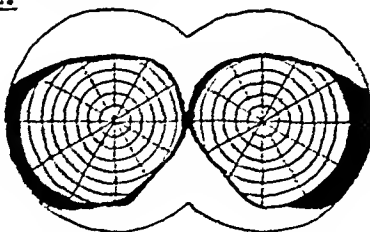
May 2, 1938

R 20/65 J 6

L 20/65 J 3

L.E.

R.E.

 $\frac{3.0 \text{ mm.}}{330}$ 

L

R



3, 2, 1.0 mm. white 10.0 mm. white
 ----- 5.0 mm. white ----- 5.0 mm. white

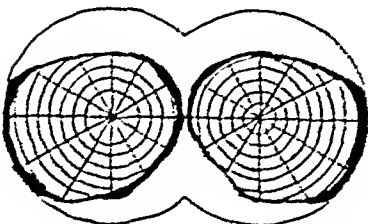
June 24, 1938

R 20/100

L 20/50-1

L.E.

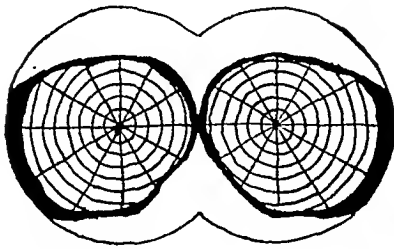
R.E.



5 mm./330 mm.

August 10, 1938

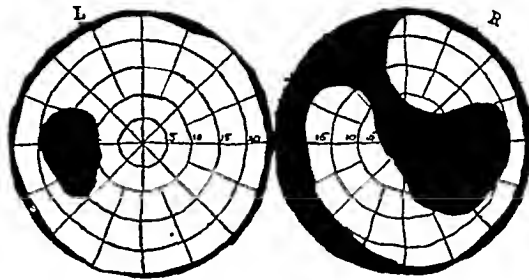
R 20/65 + 1 J 7
 L 20/65 J 4
 L.E. R.E.



3 mm./ 330 mm.

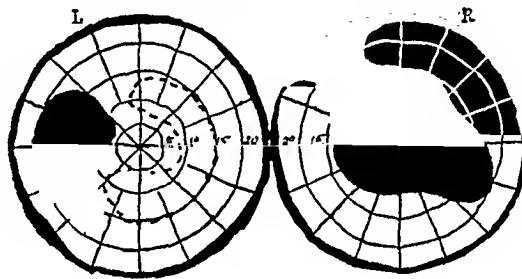
5 mm./ 1000 mm.

15 mm./1000 mm.

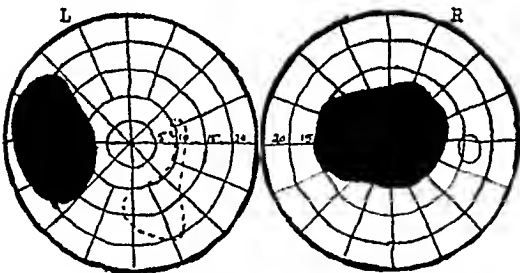
August 17, 1938.

10.0 mm.

----- 5.0 mm./1000 mm.

August 24, 1938

R 20/65 1 J 7
 L 20/65 2 J

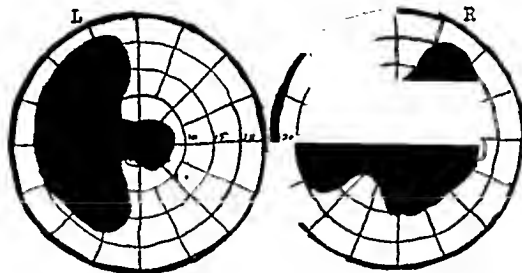


----- 10.0 mm.
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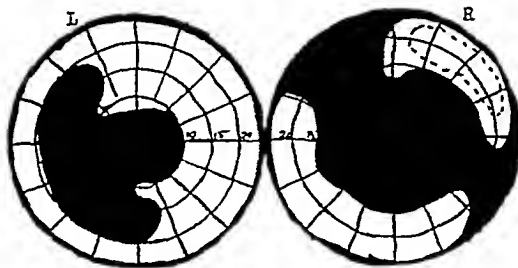
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September 21, 1938

R Fingers at 2 feet
 L 20/200 very blurred. No Jaeger



10.0 mm./1000 mm.

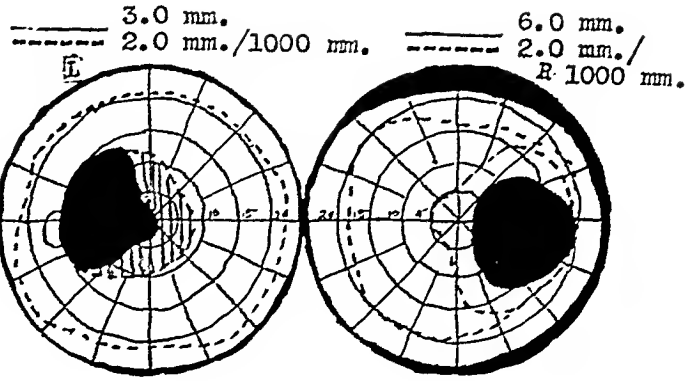
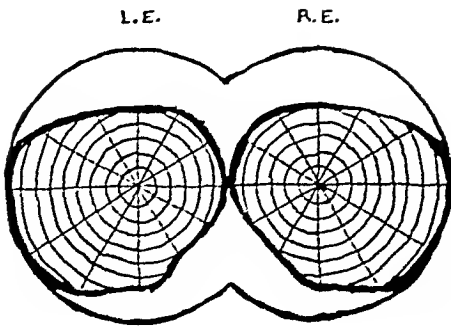
October 19, 1938

5.0 mm./1000 mm.

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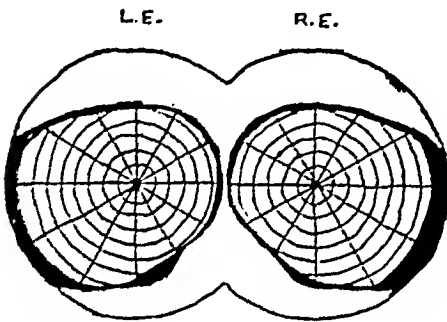
December 5, 1938

3.0 mm./330 mm.



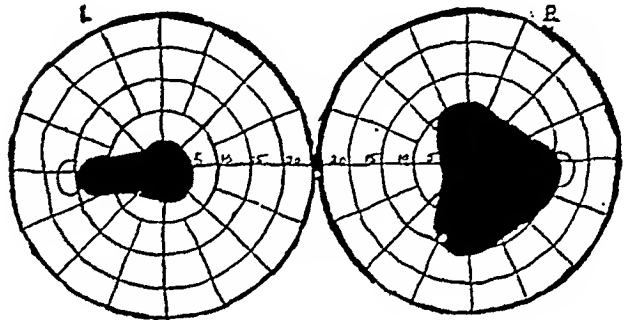
December 16, 1938

3.0 mm. /1000 mm.



3.0 mm./1000 mm.

5.0 mm./1000 mm.



right eye, with a 10-mm. white target, was 20 degrees and with a 5-mm., was 10 degrees. The blind spot was four times the normal size. The patient's responses were not consistent, because she could see the 5-mm. target before the use of the 10-mm. but not afterward. In the left eye the field for 3-mm. was 12 degrees and for the 2-mm. and 1-mm., 5 degrees.

On May 9, 1938, the fundi had returned to normal. On the 12th, a basal metabolic test was ± 0 , and on the day following, the patient was reexamined by her private physician, who found nothing abnormal. Her blood pressure was in the lower range of normal.

The patient had a head cold on June 1, 1938, and complained of a severe frontal headache. Her vision was R.E. 20/65, L.E. 20/40, and Jaeger 5 both eyes, the best vision she had obtained in some time. The frontal sinuses were absent

and the remainder were clear. A diagnosis of chronic nasopharyngitis was made by the attending physician of the ear, nose, and throat department.

On June 24th the vision was R.E. 20/100 and L.E. 20/50. The disc of the right eye was pale, and peculiar vertical light reflexes passed through the macular area. No swelling was noted. The peripheral fields were abnormal and no central fields were recorded.

From this time until July 6th, the patient felt very well. Vision remained the same. Slight paleness of the temporal half of the disc of the right eye was noted. Dr. Gifford considered that the peripheral vessels, particularly on the nasal side of the right disc, were narrower than normal and somewhat spastic. The patient was referred to the Vascular Clinic where a special study was being conducted on peripheral vascular conditions by Dr. Gilbert H. Marquardt. The

patient was found to have extreme spasticity of the peripheral vessels of the fingers and toes and a blood pressure in the lower range of normal. She was placed on theaminol, a vasodilator. A neurological examination at this time disclosed nothing abnormal.

On August 10, 1938 her vision was R.E. 20/65 and Jaeger 7; L.E. 20/65 and Jaeger 4. With the right eye a 15-mm. white target was the smallest that the patient could perceive. The blind spot was enlarged and joined with a large scotoma of the central field, extending out to the 5-degree isopter and to the periphery between the meridians at the 10- and 12-o'clock positions. A 5-mm. target was the smallest that the left eye could perceive. The blind spot was about four times its normal size and no scotoma could be plotted. No change in the fundi was noted.

A week later her vision was the same. The scotoma of the right eye remained about the same, but the blind spot of the left eye had increased in size and was extending towards the macula and inferiorly. A slight veiling of the disc margin of the right eye was seen. Radial folds extended from the macula, giving the area a wavy appearance and were due probably to irregular swelling of the internal limiting membrane. There were similar changes in the left macula and the arteries throughout the fundus were narrowed.

On August 31st, Miss R. complained of a pounding headache in the frontal area, of a week's duration. It was present when she arose in the morning, persisted all day, but did not prevent sleep at night. Shifting the position of the head did not alter the discomfort. Her vision had dropped to R.E. 20/200 and no Jaeger; L.E. 20/200 and Jaeger 7. The scotoma with the 10-mm. white target remained the same, but the field for the 5-mm. in the left eye was definitely smal-

ler. Both disc margins were blurred and the central portion of the discs was swollen so that the physiological cups were obliterated. Fine pigment dust was seen in the periphery of both fundi for the first time. It was particularly dense in the inferior portion of each fundus. The patient was again hospitalized.

A complete physical examination, including a careful neurological, revealed nothing abnormal. The spinal puncture was repeated, and the pressure and the fluid were normal. Four typhoid injections at three-day intervals were given intravenously, the first 30 million and the last three 50 million. The patient had good temperature reactions. On her discharge from the hospital her vision was R.E. 20/100 and no Jaeger; L.E. 20/65 and Jaeger 5.

On September 16th, a slight congestion of the nose, nasopharynx, and pharynx was found. The sinuses transilluminated well. The X-ray report stated that the frontal sinuses were congenitally absent, the ethmoid cells on either side were slightly hazy, the left antrum was not so translucent as the right, and the outlines of the right were hazy. The sphenoid sinuses and sella turcica were normal. On September 23d, the clinicians of the nose and throat department considered the sinuses clear.

October 13, 1938. The patient had had an abscessed tooth removed the previous day and was having a severe general reaction. Her vision was R.E. 1/200, L.E. 20/200 and no Jaeger. The discs had a peculiar pale-yellow cast, not a true pallor, and the disc margins were sharp. There was a silvery sheen to both maculae but no swelling, and the arteries remained narrow. The extreme periphery of both fundi had a faintly mottled appearance. The patient was advised to rest until her recovery from the tooth extraction and then return.

On October 19th, the patient's vision

was R.E. 8/200 and L.E. 20/200; no Jaeger. Both right and left scotomas had increased markedly in size. Throughout this period of study arachnoiditis had been considered as an etiological factor, but no localizing symptoms or characteristic fields could be discovered. Since the only causative factor present seemed to be the marked vascular spasm, cervical sympathectomy was considered the logical procedure. An intracranial operation appeared much too radical on the basis of the findings. Dr. Gifford advised that the patient be hospitalized and cervical sympathectomy performed.

Her blood pressure on admission to the hospital was 80/60. In spite of this, the marked vascular spasm persisted. Dr. Gifford noted that the arteries of the right eye were threadlike, much more spastic than at any previous examination. No neurological changes could be found. Typhoid injections and vasodilators gave no improvement. A cervical sympathectomy was done on the left side on November 2, 1938, and on the right side on November 11th. Her recovery was uneventful.

On discharge from the hospital, November 30, 1938, her vision was R.E. 5/200 and no Jaeger; L.E. 20/100 and Jaeger 7 at 10 inches. The right scotoma had disappeared, and only an enlarged blind spot remained, upon using a 6-mm. and 2-mm. white target. From the vision it would seem that a small central scotoma should be present, but poor fixation probably accounted for the inability to plot it. The left blind spot was enlarged and, using a 2-mm. object, was found to be joined to a small central scotoma. The peripheral fields remained normal.

On December 5, 1938, vision in the right eye was 20/200, in the left, 20/65 and Jaeger 7. With the pupils dilated with 2-percent homatropine hydro-

bromide, the arteries in the right eye, particularly the peripheral and macular vessels, were found to be noticeably larger and almost normal in caliber. Vessels of the left eye were still slightly spastic and less improvement was seen than in the right. The maculae appeared to be normal. Both discs had well-defined margins and were of normal color.

The patient is to be studied further in the clinic.

DISCUSSION

The confusing and apparently inconsistent findings in this case caused difficulties in arriving at a diagnosis. The changing fundus picture and the loss of central vision forced the discarding of a diagnosis of a functional disturbance even though the fields during the first few months were so characteristic of this condition. Multiple sclerosis, which often presents bizarre symptoms and objective findings, would seem to be excluded since no other signs of the condition have been found in the year of observation in the clinic nor previously while under the care of a private physician. No localizing symptoms, X-ray findings, nor fields characteristic of any type of intracranial lesion have been noted. The basal metabolism was normal, as was the menstrual cycle, which would indicate a normal glandular balance.

The only etiology for the symptoms and findings in this case is the retinal angiospasm, which is part of a generalized spastic condition of all of the peripheral vessels. This spasticity persists in spite of a low blood pressure which seems to be a part of this clinical picture. After a known duration of one year of the condition, the discs are still of normal color and show no signs of optic atrophy. The patient's visual difficulties, as well as her general exhaustion, can be explained on this vascular basis.

25 East Washington Street.

NOTES, CASES, INSTRUMENTS

MELANOSARCOMA OF THE CILIARY BODY AND IRIS

REPORT OF A CASE

S. A. AGATSTON, M.D. AND SAMUEL GARTNER, M.D.

New York

Mortality in ophthalmology is largely dependent on the incidence of malignant tumor, especially melanosa sarcoma. Frequency of this condition is difficult to determine. Mortality statistics are published by the various health departments in tables with limited detail. International nomenclature of causes of death is followed. The common malignancies of general organs are listed separately; however, others are grouped together in the category "Cancer of other unspecified organs." This group includes all malignancies of the eye, muscles, lymph glands, and several other organs as well as cases in which the organ primarily affected was not determined. No classification of the malignancies of the eye nor separation of retinoblastoma from melanosa sarcoma could be found. We studied the available statistical reports and wrote to many cities and states throughout the country, but none classified their ocular malignancies separately. The foreign statistics are no more illuminating. New York City Health Department, in a special report compiled for 1935 to 1938, listed 58 deaths due to malignancies of the eye for the white population of 7,010,841; an annual rate of 2.76 per million. This included all malignancies of the eye. Records of the New York Eye and Ear Infirmary showed that two thirds of the ocular malignancies were melanosa sarcomas. We can, therefore, estimate a death rate for melanosa sarcoma of the eye of 1.84 per million for the white population each year. We can com-

pute from this that, in the United States, at least 220 white people die each year from melanosa sarcoma of the eye. The total number of cases must be higher, for these figures are only for fatal cases and do not account for those cured or undiagnosed. The late appearance of metastases causes a delayed mortality and makes an accurate check impossible.

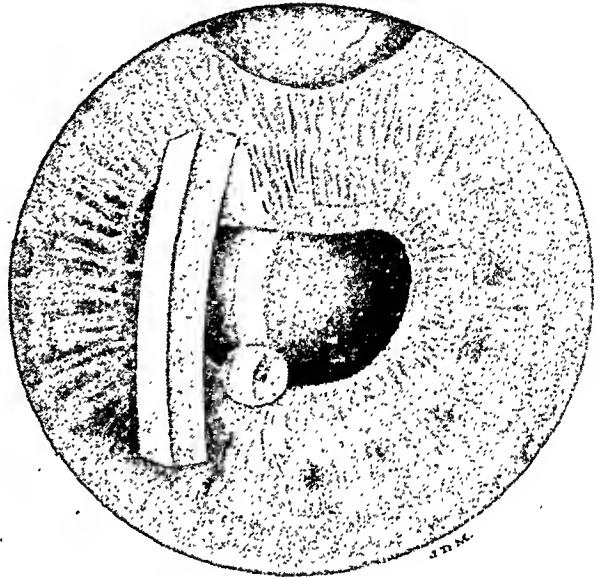


Fig. 1 (Agatston and Gartner). Melanosa sarcoma of ciliary body and iris.

Few figures are available for the death rate of those affected with melanosa sarcoma. Nathanson and Welch in 1937 studied 128 cases and found a five-year death rate of 67.5 percent and a six-year death rate of 75 percent.

Even at the large clinics few cases of melanosa sarcoma are seen. At the New York Eye and Ear Infirmary, from 1935 to 1938, there were 70,000 clinic patients with 11 cases of melanosa sarcoma. Terry and Johns in 1935 reported that at the Massachusetts Eye and Ear Infirmary melanosa sarcoma was found in one out of every 2,000 patients in their clinic. Stallard, reporting the statistics of Moorfield's

Eye Hospital in London from 1925 to 1931, found one out of every 4,000 patients had melanosaarcoma.

The occurrence of melanosaarcoma of the ciliary body is still rarer. Investigations of Lawford and Collins in 1891 and Kronenberg in 1938 showed that the ciliary body was affected in 2 to 6 percent of the cases.

The studies show melanosaarcoma does not favor any portion of the uveal tract. Its relative frequency in the choroid, ciliary body, and iris is about proportional to the amount of uveal tissue contained. This is further borne out by the location of tumors in the choroid. Over 75 percent of the tumors occur in the posterior segment where the choroid is thickest. Anteriorly, where the choroid is thin, fewer tumors develop.

Seven hundred and fifty-five cases were collected from various sources in the literature. Four hundred and twenty-one were in males, 334 in females, an incidence of 56 percent for males, and 44 percent for females. In 550 cases the ages were available; few of the patients were under 10, and the greatest number were between 40 and 60 years of age. The average age of those with melanosaarcoma of the iris was 35 years, while that of those with involvement of the choroid and ciliary body was 47 years.

Melanin is normally present in the skin, the pigmented epithelial layer, and the uveal tract. In Negroes it is most abundant. It is rather striking that melanosaarcoma is exceedingly rare in the Negro. The statistics of the New York City Board of Health show that from 1935 to 1938 in a colored population of 423,505 there were no deaths due to malignancies of the eye. As noted previously the white population had an incidence of approximately 2.76 per million per year. Matas in 1896 drew attention to the rarity of melanosaarcoma in the Negro. This was

confirmed by Bishop in 1932 in a study of its incidence at the Emory University Division of the Grady Municipal Hospital at Atlanta, Georgia, for colored patients. From 1921 to 1931, there were 956 cases with tumors of various types. Only one was melanosaarcoma. Quinland in 1936 reported that on a large Negro service, he had seen three cases of melansaarcoma of the skin, none of the eye. In the recent edition of MacCallum's Pathology, an observation was made that melanoma is common in white and gray horses, but has not been found in black horses.

The origin of melanosaarcoma has not been determined. Von Recklinghausen claimed they arose from endothelium. Krompecher claimed epithelial origin. A study by Ribbert in 1911 indicated that the pigmented cells were mesodermal and developed from chromatophores.

Dawson, in 1925, made an exhaustive study of melanoma and suggested that the pigmented cells in the uveal tract came from the pigmented epithelium cells which wandered into the uvea in embryo.

Mann pointed out the dominance of the pigment epithelium over the development of the choroid. Only where the pigment epithelium is present does choroid develop.

Masson in 1931 demonstrated a neuroectodermal origin of nevi and melanosaarcoma of the skin. He showed an association of these growths with terminal end organs of the sensory nerves. The occurrence of similar melanomas in the skin and conjunctiva indicates an ectodermal origin. The ectodermal origin of uveal melanosaarcoma appears probable, though not absolutely proved. Thus, the classification of these tumors as sarcomas is questionable. Malignant melanoma appears to be a more suitable term.

The morphology of the tumor cells is variable. Some are round cells, some spindle, some polyhedral. Pigmentation of

the cells is usual. Callender in 1931 and 1935 made a careful study of the morphology and staining characteristics. He classified them into spindle cells with subtype A and B, fascicular type, epithelial type, and mixed type. The spindle cells end in fibers resembling fibroblasts. Subtype A has a nucleus with delicate reticular structure in which nucleolar material is not well defined. Subtype B has a nucleus with a coarse network and a sharply defined, deeply stained, small, round nucleolus. The fascicular-type cells are elongated, sometimes with fiberlike structures, but rounded and polygonal shapes are seen. The majority of the cells are arranged in fasciculi or columns. The cells in the column radiate about a center, which is a lymphatic or capillary blood vessel. The epithelioid type are polygonal cells of relatively large size. The mixed-cell type contains an irregular mixture of spindle and epithelioid types of cells with occasional areas of fascicular type.

The lowest mortality was found in subtype A of spindle cells. Of the others, the worst was the mixed-cell type. In 1935 Callender and Wilder described staining methods with silver salts which aided in evaluation of the degree of malignancy.

On account of the numerous variations, errors in diagnosis are common. The typical course has been described by Fuchs in four classical stages. In the first, the growth is localized in the eye and retinal detachment occurs. In the second, congestive glaucoma develops. The third is marked by perforation of the globe and orbital extension. The fourth corresponds to metastases, especially to the liver. Glaucoma may be the first sign.

Necrosis of the tumor often occurs and confuses the clinical picture. Samuels examined 106 cases of melanosarcoma, of which 31 were necrotic. Of the 31 cases with necrosis, an erroneous diagnosis was

made in 20, mainly of glaucoma. Samuels called attention to iridocyclitis with a chocolate-colored exudate in the anterior chamber, and the additional appearance of scleritis as signs of necrosis.

Terry and Johns in their series of 94 cases from Massachusetts Eye and Ear Infirmary reported that in 42 cases an erroneous diagnosis of glaucoma, retinal detachment, cataract, uveitis, and opaque cornea was made.

Early in its development, melanosarcoma of the ciliary body gives no symptoms and cannot be seen. Symptoms are manifest later than in tumor of the choroid. Early symptoms are change of refraction and loss of accommodation. This is easily overlooked. Subluxation of the lens, or an opacity of the lens may be an early sign. Later, the iris becomes displaced, it protrudes into the anterior chamber, and the pupil becomes distorted. As the growth progresses the tumor may be visible at the angle and appear as a dark crescent at the root of the iris, simulating iridodialysis. Transillumination, however, is positive. The superficial blood vessels over the tumor become engorged and are readily seen. This vascular engorgement has a diagnostic significance.

Retinal detachment occurs later in melanosarcoma of the ciliary body than in that of the choroid, which accounts for delay of subjective scotoma.

In melanosarcoma of the ciliary body, glaucoma occurs only occasionally. Terry and Johns in 1935 found that 28 percent of their cases of ciliary-body tumors were associated with glaucoma, while 47 percent of the choroidal cases presented this association. Dunnington in 1938 reported a series in which 12.5 percent of cases with ciliary-body tumors presented glaucoma, while in 29.8 percent of those with choroidal growths glaucoma occurred.

According to studies of Denecke in

1936, the mortality of melanosaarcoma of the ciliary body is higher than that of the choroid or iris. Other reports seem to corroborate this. Samuels in 1933 states that tumors that reach the angle are particularly dangerous to life because of their tendency to invade Schlemm's canal and the anterior ciliary vessels. In our case this invasion is clearly demonstrable. This fact together with late recognition is the cause of higher mortality of melanosaarcoma of the ciliary body.

Melanosaarcoma of the iris is rare. Rosenbaum in 1938 reported a case in which a yellow-brown spot, apparently congenital, developed into a melanosaarcoma. Many iris tumors have been watched for years before they were removed. Mayou in 1930 reported a melanosaarcoma of the iris observed 13 years before enucleation. Chance in 1928 reported a sarcoma present 27 years before enucleation.

Melanosaarcoma of the skin is easy of observation. Many develop from nevi which remained unchanged for years. Others start without any apparent nevi. Growth is usually very slow at first. After months, in many cases after years, the rate of growth is accelerated. Metastases usually develop after many years.

Most probably the melanosaarcoma of the ciliary body and choroid follows a similar course. Since early recognition is difficult, it may be of several years' duration when first noted. Metastases are also late manifestations.

Sympathetic ophthalmia as a complication has been reported in a few cases. An intraocular operation, such as iridectomy for relief of glaucoma, is a likely factor. In one of Samuels's cases there was evidence of an old injury at the limbus in addition to the tumor. Terry and Johns reported a case of sympathetic ophthalmia with melanosaarcoma that had

perforated the globe. A few rare cases were reported by Fuchs and by Samuels, in which sympathetic ophthalmia apparently developed in a globe not operated upon and not perforated.

X-ray and radium therapy for melanosaarcoma of the eye have been tried. Jane-way in 1920 treated three cases with radiation, but there were recurrences in all. Birch-Hirschfeld in 1922 treated a case with apparent improvement, but later acute glaucoma set in, and the eye had to be enucleated. Section showed necrosis with some active sarcoma cells. Parker and Stokes in 1926 reported a case in which the neoplasm seemed to shrink after radium. Stallard in 1932, after exhaustive study, found no authentic cure of melanosaarcoma of the eye by X ray or radium.

In removing melanosaarcoma of the skin, wide excision of neighboring tissue and its area of lymphatic drainage seemed to prevent recurrence.

In melanosaarcoma of the eye, the usual operation has been a simple enucleation. In some cases, after local recurrence, exenteration is performed. The latter is probably more palliative than curative.

Case Report. S. B., white, a housewife, aged 27 years, presented herself at the New York Eye and Ear Infirmary, on October 12, 1938.

Several months previously, she had first noticed a change in the appearance of the pupil of the left eye, but paid no special attention to it. She suddenly became aware of defective vision in this eye on the day before her visit. Her past history and that of her family were essentially negative. Vision had always been good.

Vision was O.D. 20/30; O.S. 20/70. The right eye was apparently normal, with clear media and normal hyperopic fundus. The left eye presented normal lids and conjunctiva. Radiating from the limbus at the 12-o'clock position there

was an area of paracorneal injection. The cornea was clear; the slitlamp examination, negative. The anterior chamber was shallow, much shallower above than below. There was a displacement of the pupil downward. The outline was irregular. At the upper margin, an irregular, dark-brown mass was seen between the iris and the lens. The upper half of the iris bulged forward, almost in contact with the cornea; its upper border showed a dark crescent simulating iridodialysis. In the pupillary area a small cyst was visible. The lens was clear. The vitreous was hazy with dustlike opacities. The fundus could not be clearly seen but did not seem to be pathological.

The tension was O.D. 18 mm. Hg. (Schiotz), O.S. 20 mm. The field of vision was normal for the right eye; the left presented a large defect below and temporal, almost to the fixation point.

By transillumination, the right eye was negative. In the left eye a positive shadow was seen above.

Diagnosis: Melanosarcoma of the ciliary body.

The physical examination was negative; there were no metastases, nor was

there any melanin in the urine. The Wassermann reaction was negative.

Treatment: On October 19, 1938, the left eye was enucleated. The pathological report by Dr. Bernard Samuels corroborated the diagnosis.

SUMMARY

A study of melanosarcoma was made, special attention being given to involvement of the ciliary body and iris. A typical case is reported.

Melanosarcoma of the ciliary body is especially characterized by a greater obscurity and delay in symptoms and diagnosis. Retinal detachment occurs late, glaucoma is less frequent, and the mortality is higher than in cases of melanosarcoma of the choroid or iris.

Tumors primary in the iris are recognized earliest and have the lowest mortality.

Melanoma seems rare in the Negro.

A study of these tumors indicated that their origin from neuroectoderm is probable.

Malignant melanoma seems to be a more suitable term than melanosarcoma.

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A NEW SURGICAL TECHNIQUE FOR DACRYOCYSTITIS

HUGH MILLER, M.D.
Kansas City, Missouri

Because of the difficulties to be overcome in the treatment of dacryocystitis, and because of the uncertain results, numerous procedures have been recommended for its cure. Apparently, no method nor technique presented to date has been uniformly successful. For this reason a technique that has proved eminently satisfactory in the writer's hands is herewith presented, and in the same connection attention is called to some of the reasons why some of the so-called standard methods have resulted in failure.

Just a word regarding the physiology of the lacrimal apparatus. The tears are directed toward the inner canthus principally by the motion of the lids. Within the lacrimal bay the tears are sucked up by the puncta, which must be in constant contact with the eyeball so that this may take place. This sucking force is sup-

plied by a very essential mechanism—the lacrimal canaliculi surrounded by Horner's muscle. The action is similar to that produced by the hand in milking a cow. In milking, however, the hand expels the milk, whereas in this mechanism, the spiral Horner's muscle acts to suck up the tears and empty them into the lacrimal sac, whence they are carried to the nose by gravity and by the nasal respiratory act. By the act of inhaling, the valve at the nasal terminus of the duct opens, and the contents are drawn into the nares.

Now any line of treatment for correcting epiphora or dacryocystitis that does not fully consider the importance of the puncta or destroys the function of the spiral muscular fibers of Horner and the canaliculus (Norris-Oliver, v. 1, p. 93) or disregards the plica lacrimalis results in failure. In former years the writer performed the classical operation, slitting the canaliculus until a large probe could be passed directly through the sac and into the nose. Yet there was always disappointment when the lacrimal function was not restored, and when dacryocys-

titis persisted. The writer has seen many patients who have been operated upon in this manner, but epiphora or, as the case may be, dacryocystitis has remained—patients operated on for the removal of the infected sac, or by whom a silver tube has been worn for years, neither method yielding success. Epiphora still remains to the discomfort of the patient. Surgery to create a new and more direct communication with the nasal chamber by an artificial finestrum has not produced the desired results and leaves too great a possibility for ocular infection from the nasal cavity. Failure, by these methods, has resulted because the most essential elements in carrying off the tears have been overlooked or disregarded.

For years, realizing that the full preservation of this function is most necessary, the writer has followed a procedure that does not materially harm the function of the punctum nor of the canaliculus. The technique consists, first, in the manner of incising the punctum and canaliculus, and, second, in the manner of the incisions of the plica lacrimalis.

In the classical operation (Fuchs, ed. 3, p. 603; De Schweinitz, ed. 3, p. 661) in slitting the punctum, we are instructed "to have the cutting edge of the knife upward and slightly backward, and to pass the knife horizontally until the bulbous point enters the upper end of the sac." By this movement the roof of the canaliculus is slit to the entrance of the sac.

TECHNIQUE

First step: This procedure differs from the classical one in several very important points. After the tip of the lacrimal knife has entered the lower punctum, and while the knife is being brought to a horizontal position, instead of having its cutting edge directed upward and slightly backward, the edge is directed *downward* and slightly *forward*, so that the cutting

is entirely *within the lid*. The bulbous tip of the knife follows the canaliculus. When the tip of the knife enters the upper end of the sac, its handle is elevated to a perpendicular position and it passes downward. By this procedure, the punctum and the canaliculus are made large enough to admit a no. 8 or 10 Theobald probe, or a silver or other pliable syringe tip. An operation by this technique leaves the functions of the punctum and of the canaliculus unharmed, as the severed muscular fibers of the punctum and the canaliculus reunite; but an easy access is given to the sac since the punctum and the canaliculus remain somewhat enlarged. Probing should follow at frequent intervals (every five or six days). Caution: The knife must be withdrawn with the cutting edge outward in the same position as it entered the sac, so that but one incision is made.

Of course it is still necessary to carry on treatment as indicated for the cure of the infected sac. Sounds, antiseptic irrigation and like measures are still necessary. Having established a means of reaching the sac, the operator is enabled to carry on these treatments more easily and successfully.

Second step: After incising the floor of the canaliculus and entering the sac the lacrimal knife is passed on down through the nasolacrimal duct into the nose, great care being taken as to the position of the cutting edge of the knife. The cutting edge should first be directed forward as it passes downward to enter the nasal cavity in a plane parallel to the outer wall of the nose, then drawn back into the sac and turned so that the cutting edge is backward, and again passed downward into the nasal cavity. In this manner, adhesions at either angle of the valve-flap (plica lacrimalis) are freed. To pass the knife into the nasal cavity with the

cutting edge directed inward may actually be harmful. Indiscriminate cutting may result in such injury to this valve that the patient in blowing the nose will cause the discharge to pass through the duct and the sac into the eye, thereby endangering the latter. In performing this operation it is necessary also to use a delicate, straight canaliculus knife with a fine probe point, such as Weber's or Agnew's. Irrigation should be done with a lacrimal syringe having a probe-pointed tip.

Numerous cases could be cited of simple noninfected obstruction of the lacrimal drainage and also of infected suppurative conditions. The following case will suffice to show the results from the technique employed:

Mrs. N., a woman in her late thirties, had been suffering from dacryocystitis for many years. In her case dacryocystitis had developed finally into a cystic abscess that was continually rupturing and draining on the face. Under the care of good ophthalmic surgeons her condition would improve, only to relapse after a brief period, and never reaching the

point where it was entirely satisfactory. The patient consulted the writer on January 17, 1937. She had an abscess of the right sac that was almost ready to break.

Operation: The abscess was incised directly into the sac, the pus washed out with an antiseptic solution, and the cavity wiped with a 5-percent silver-nitrate solution. After the acute condition had subsided (February 7, 1937), the method described above was followed. The patient returned for treatment on January 18, 20, 25, 27; February 7, 12, 18, 20; March 3, 5, 16, 19, 25; April 3, 19; May 1, 22; July 24, and on September 4. These dates are cited to show how few treatments were required to clear up a chronic condition—from January to May. The patient was asked to report in May, July, and September in order that a check might be kept on her condition. At these three last calls there was no evidence of infection, no epiphora, and no evidence of the surgical interference, save a slight scar where the abscess had been incised.

Argyle Building.

SOCIETY PROCEEDINGS

Edited by DR. H. ROMMEL HILDRETH

SAINT LOUIS OPHTHALMIC SOCIETY

November 25, 1938

DR. ROY E. MASON, *president*

PRESCRIBING BUFFERED SOLUTIONS

DR. CARL BEISBARTH said there are many factors which influence the effect of ophthalmic solutions used therapeutically. The proper preparation of collyria should include a consideration of two of these factors. One group of workers interested in the field of ocular therapeutics lays stress on the value of the tonicity of the solution. A solution which is nearly isotonic with the lacrimal secretion is less likely to be irritating than one which is hypertonic or hypotonic. Another group advocates the adjustment of the acid and alkaline values or hydrogen-ion concentration of the solution.

In order to maintain collyria at the desired degree of acidity or alkalinity it is necessary that these solutions be "buffered." To "buffer" is to add certain substances or solutions of those substances which maintain a definitely desired pH in a collyrium. It is, of course, necessary to select a buffer which will not interfere with the main action.

When collyria are buffered at the desired pH they are less irritating, more easily absorbed, and are more stable in action. Furthermore, a solution buffered to the proper pH may be much more efficacious than a solution of the same drug made up of distilled water. It is a fact that the presence of free acid or alkali profoundly affects the bacterial flora. The reaction may favor or inhibit the growth of organisms. A solution of boric acid may cure a case of conjunc-

tivitis or make it worse depending upon the cause of the inflammation. The sensation produced by collyria is unimportant when a patient requires but a single dose, but whether or not the sensation is disagreeable becomes very important when the dose must be repeated frequently over long periods of time; as, for example, with physostigmine.

Pure distilled water is free from salts and theoretically has a pH value of 7.0 at 22°C. Actually the reaction to ordinary distilled water is always acid because of the absorption of CO₂. In testing a number of freshly prepared solutions of drugs ordinarily prescribed he found them all to be acid, ranging from pH 4.5 to pH 5.8. They became even more acid after standing for several weeks.

Gifford has compiled a table for the preparation of solutions of pH ranging from 5.0 to 9.0 by using various amounts of two stock solutions, one of boric acid and potassium chloride, and another solution of sodium carbonate.

It has been stated that it is not practical to hand over formulas to the druggist and get solutions of the desired pH. He has found that prescribed buffered solutions using the two basic solutions of Gifford and Smith, have always been accurate within the range of testing with nitrazine papers.

In prescribing, the pH reaction of buffered solutions selected depends upon the drug employed, because some compounds are unstable in solutions of certain hydrogen-ion concentrations. The pH of prescribed buffered solutions also depends on the condition under treatment because certain ocular injuries and infections call for the use of definite acid or alkaline

solutions. Cocaine and epinephrine are not soluble in alkaline solutions, while alkaloids are best absorbed, as well as less irritating, in an alkaline solution. Gifford recommends a solution of pH 7.6 for homatropine, atropine, and pilocarpine.

The irritating qualities of physostigmine solutions can be reduced to a minimum by using the drug in a solution which has a pH of between 6.2 and 7.6. More alkaline solutions of eserine are unstable. The resulting color change of these solutions is probably an oxidation process and can be controlled by adding a reducing agent to the solution. While the resulting color change does not affect the efficiency of the physostigmine as a miotic it does disturb the patient psychologically, and frequently the conjunctiva becomes red and irritated at about the same time that the solution has turned pink. The addition of sodium formaldehyde sulfoxylate in a concentration of 1:5000 prevents the development of color in a solution of eserine.

Butyn and phenacaine are insoluble in an alkaline solution and are incompatible with chlorides. Sodium fluorescein dissolves only at pH 9.0 (approximately a 2.5-percent solution of sodium carbonate).

The pH of tears is commonly accepted to be approximately 7.4 although some authorities state the pH varies from 7.2 to 7.6. Certain European authorities have found that ocular secretion has a pH of 8.4 to 8.6. The answer to the question of the exact pH of lacrimal fluid is obstructed by the difficulty of obtaining sufficient material and by variations in normal individuals. In general, conditions causing acidity in the eye should be treated with alkaline collyria and vice versa. If the reaction of the tears is already highly alkaline and an acid buffer solution is instilled, relief is experienced instantaneously. Corneal injuries almost without exception produce a shift to the alkaline

side (pH 8 to pH 8.4) and should be compensated for by treatment with acid collyria. Ulcers of the cornea, if acute and painful, also produce a shift to the alkaline side, and an acid buffer solution affords considerable relief.

In the treatment of conjunctivitis and corneal lesions we should aim to produce the optimum pH for the growth of epithelium and connective tissue. Fisher has shown that the optimum pH for the growth of fibroblasts is from 7.4 to 7.8 and that a slight change above or below these limits materially retards growth. Fibroblasts grow only from 4 to 6 generations at a pH of 5.5 and not much over 10 generations at a pH of 8.5.

Discussion. Dr. Roy Mason said he had been interested in the science of buffering prescriptions ever since Dr. Gifford wrote his interesting paper on the buffering of ophthalmic solutions. He had found that it is possible to prescribe zinc-sulphate solutions with a buffer solution which causes very little irritation to the patient, making a more elegant prescription and just as efficient. Buffered prescriptions remain clear a greater length of time, are less irritable to the patient, and more efficient in results.

Dr. Carl Beisbarth said in reply to Dr. Elz that he did not mention silver nitrate because it is so strongly acid that it cannot be buffered. When drugs are used for long periods it is especially desirable to buffer them. A consideration of the hydrogen-ion concentration of prescribed solutions affords a refinement in ophthalmic therapeutics and may affect the results obtained in specific medication.

FILAMENTOUS KERATITIS WITH REPORT OF A CASE

DR. WILLIAM H. MEINBERG read a paper on this subject which will be published in this Journal.

Discussion. Dr. Lawrence Post stated that there was no great difficulty in differentiating this condition from other keratitides. Characteristically, from 1 to 15 white threads of epithelium hang down from the cornea and lie coiled or floating in the tears. They are usually more numerous on the nasal side of the cornea, possibly because further from the source of the tears. That two cases should occur in the practice of one man in such a short period makes it seem that these cases are more numerous than is supposed and that they are being overlooked. If the first had not been seen, the second would have been overlooked. Dr. Meinberg had been ready to block the tear ducts, but the patient was getting better on ovarian extract, vitamins, and holocaine ointment so nothing else was done. It is probably true that ordinary methods of blocking the tear ducts are not successful and that cauterization is necessary. He has seen one case following cataract extraction. Each eye was affected but recovered without any special treatment in four or five weeks' time.

Dr. W. Luedde had had a patient, a medical student, who had a superficial keratitis related to being out in the open. He had a history of having fallen into a pan of hot water as a baby and wondered if damage had been done to the epithelium although scars had vanished. Relief was obtained by putting on rubber rimmed spectacles, rubber running along the temple. This is a way to try to get temporary relief, preventing evaporation from the cornea.

Dr. L. C. Drews had seen a man from Arizona with filamentous keratitis; there were 20 to 30 filaments on each eye. He used fibrolysine on the eyes and it cleared up. Two years later the patient returned after treatment for six weeks, and Dr. Drews again used fibrolysine with success.

Dr. William M. James said that it is interesting that considering the scarcity of tears as reported here, blocking the canaliculi should have a curative effect. The normal tear flow is taken care of largely by evaporation rather than by passage into the puncta. There are two points that might be considered in therapy. It has been reported that in experimental animals on a vitamin-deficiency diet the instillation of tears into the conjunctival sac once or twice daily will prevent corneal complications. The use of acetylcholine might stimulate an adequate flow of tears.

LATERAL IRIDENCELEISIS PRELIMINARY TO INTRACAPSULAR EXTRACTION IN GLAUCOMA ASSOCIATED WITH CATARACT

DR. JOHN GREEN and DR. J. B. WORKMAN (by invitation) reported that N. R., a woman, aged 78 years, entered the Saint Louis City Hospital eye clinic on June 15, 1938. She complained of failing vision in both eyes for the past two years. An accident 10 years prior to her entrance was followed by an ulcer on the left cornea which resulted in a scar over the pupil; consequently the vision in the left eye was somewhat impaired. A diagnosis of chronic simple glaucoma was made on the basis of a constant range of tension from 25 to 35 mm. (Schiötz) in each eye. The patient's coöperation was poor, and Dr. Workman was unable to get a satisfactory field. Both lenses showed cataractous changes, more marked in the left eye. The disc of the right eye showed a typical glaucomatous cup; that of the left eye could not be seen on account of the lens changes. Vision R.E. 6/200; L.E. 3/200, not improved by lenses.

It has always been a question how best to manage a chronic glaucoma associated with lens changes. The glaucoma itself will frequently yield to scleral corneal

trephining or some other type of filtering operation. Considerable embarrassment, however, ensues when one attempts to extract the lens in an eye in which there is a bleb from a trephine operation. In view of the fact that so many of these chronic glaucomas occur in senile eyes which all too frequently develop cataract following a successful filtration operation, it seems desirable to place the point of filtration at some point other than that involved in the section for the extraction of the cataract.

For a number of years Dr. Green has preferred iridencleisis to trephining. In his experience adequate filtration is afforded without excessive hypotony and without the formation of a large bleb. In this patient, he performed a lateral iridencleisis at the 8:30 o'clock position on the right eye and at the 5:30 o'clock position on the left eye.

The operations and recoveries were without incident. Subsequent tensions ranged from 15 to 18 mm. (Schiötz). About six weeks later the patient was readmitted to the hospital, and an intracapsular operation was successfully performed on the right eye. There were no complications. A peripheral iridectomy was made, but because the lens caught as it was being expressed, the iridectomy was converted into a complete one. There has been no interference with filtration.

Discussion. Dr. Meyer Wiener said he favors the trephining operation and thinks it is the operation of choice in glaucoma simplex. There are very few late infections. He has been performing it ever since Elliot came to Saint Louis and introduced the trephining operation. He has had most satisfactory results with cataract developing after trephining operation for glaucoma. Instead of disturbing the trephine opening he makes a corneal incision in front of the bleb and it must involve at least half the cornea or more.

The incision starts at the limbus below the horizontal plane and comes out in the cornea in advance of the trephining. In at least 95 percent of cases one can extract the lens by the Smith method of tumbling. The zonule is more easily ruptured than in ordinary cataract. The same holds true for very old people. The whole secret is in making the incision large enough; making it corneal, it heals without trouble and does not interfere with drainage.

Dr. Lawrence Post said he had had a similar case last spring. The patient was an elderly lady who had high intraocular tension, with steamy corneas and bilateral mature cataracts. He trephined each eye in the upper nasal quadrant. A month or two later he extracted the cataract in one eye, making the incision away from the trephining in the upper temporal quadrant and enlarging it with scissors so that the trephine bleb remained as it was. The patient has 20/30 vision now, with a badly contracted field. The eye filters perfectly still, tension is normal in this eye as also in the other eye from which he has not yet extracted the cataract. The best procedure depends much on how hard the eye is and how long the glaucoma has persisted. In early cases with only moderate elevation of tension he believes that it is wise to extract the cataract and then observe the outcome, as sometimes the extraction of the cataract will cure the glaucoma.

Dr. B. Y. Alvis said he attended an instruction course at the Academy at which Dr. O'Brien discussed cataract technique, and this question was presented. He has had tremendous experience at Iowa State. He stated that he makes the incision through the corneal scar, making the extraction and inserting sutures as if no trephining had been done. His experience is that they do not have recurrence of tension and the bleb is not closed by the

new scar. Dr. Alvis modified Dr. Wiener's incision a little in one or two cases in which he wanted to use sutures, and thought the modification helpful. A pre-formed flap was made well to each side of the trephine opening. Incision followed the limbus to the top of the flaps and then came out through clear cornea just below the trephine opening. Sutures closed the wound satisfactorily. He is not sure flaps are necessary but it makes a nice device for positive closure. The lens is easily extracted as Dr. Wiener suggested, simply by expression or by using the capsule forceps. It is important that the incision be large enough.

Dr. John Green said the filtering pad after sclerocorneal trephining is all too often large, prominent, and unsightly. For best protection by the lid, the trephine hole is placed at the 12 o'clock position. After iridencleisis the filtration area is smaller, less prominent. There is no sound reason for placing it at the same site. Placing the incision for iridencleisis anywhere in the lower circle from the 3- to the 9 o'clock position insures filtration at a point that does not interfere with the cataract section if cataract is present or develops subsequently.

The best method of extracting a cataract in a very soft eye with a large filtering pad following trephining has always been a problem. Elliot is opposed to a corneal section and suggests that the incision carry through the filtering pad and terminate in a conjunctival bridge either to the temporal or the nasal side of the trephine opening. By making the section in this manner he hopes that filtration will not be interfered with.

FASCIAL SLING FOR PARALYTIC ECTROPION

DR. JOHN GREEN said that H. P., a 70-year-old man, came to the clinic on May 7, 1938. His complaint was that he had not been able to move the right side

of his face for four-and-a-half months. The rigidity was accompanied by lachrymation, redness, and blurred vision. His ocular condition followed the extraction of a right lower premolar. The second day after this extraction he first noticed that he could not move the right side of his face, could not close his right eye, and that his mouth was drawn to the left side. The lower lid was motionless and fell away from the globe. The patient was unable to close the lids.

He was admitted to the hospital on August 28, 1938. His general condition was good and all laboratory examinations were negative. A sling of fascia lata was prepared. A groove was made with a Reverdin needle, running parallel to the lower lid and about 5 mm. from the ciliary margin, and the sling was drawn through the groove. The fascial sling extended from the internal canthal ligament to the periosteum underlying the outer third of the eyebrow, and was sutured to these tissues. Recovery was uneventful: the right lower lid is drawn up to the eyeball; there is no epiphora or recurrence of conjunctivitis. The vision is R.E., 20/25; L.E., 20/25 without correction.

Discussion. Dr. Lawrence Post said he had one little suggestion which is to make a slit in the skin at the midline and bring out the fascia lata or ox fascia there before threading it through the remaining half. He had used fascia lata in one case; ox fascia in two cases. There was no trouble with the latter.

Dr. H. Rommel Hildreth said there apparently were some misgivings about the use of the ox fascia in place of fascia lata. His experience with ox fascia had been so satisfactory it seemed unnecessary to add the leg operation for obtaining the fascia lata.

Dr. B. Y. Alvis stated that he had used ox fascia transplants, getting no undue reaction, with apparently good results.

TRANSPLANTATION OF SLITS OF VERTICAL RECTI FOR PARALYSIS OF EXTERNAL RECTUS

DR. JOHN GREEN said that V. C., a woman, aged 29 years, came to the clinic September 15, 1938. She complained of double vision and crossed eyes. She stated that at the age of 27 years she suddenly developed double vision with convergent strabismus. The crossing became progressively worse for about one week and resulted in the left eye turning in to a marked degree. She consulted an ophthalmologist, who gave her glasses and told her she would probably have to be operated on later.

At the onset of her illness she consulted her family physician who made a blood test and informed her that she was suffering from a "run-down condition." He gave her "hip-shots" twice a week for 18 months.

Physical examination included a neurological survey. All was essentially negative for the eye findings. Laboratory tests, which included several blood Kahn and one spinal-fluid Kahn test, were negative.

Eye findings: Vision, R.E., 20/25; L.E., 20/30. She had a left esotropia of 60 degrees for near and far. She fixated constantly with the right eye, tilting the head somewhat. A ptosis of the left upper lid, she stated, had been present all her life. There was a right internal ophthalmoplegia. The pupil of the left eye reacted to light and accommodation. The patient was unable to move either the right or left eye outward past the median line.

Operation by Dr. J. B. Workman on October 3d: The outer halves of the left superior and inferior recti tendons were transferred to the external rectus stump. The vertical recti tendons were slit for 10 mm. The lateral rectus tendon was resected 5 mm. and advanced 3 mm. over its

stump, using the Wiener gold-plate technique. A binocular bandage was applied for seven days.

The patient uses the left eye for distance and near work. Vision in the right eye is 20/20; in the left 20/20. The patient has excellent motion of the left eye outward. She still has the ptosis of the left upper lid. The same operation on the fellow eye is contemplated.

Discussion. Dr. Meyer Wiener believed the operation could be simplified very much by transferring strips from the paralyzed external rectus instead of mutilating the superior and inferior recti. Our method, he said, is to expose the inferior rectus, split it, then cut it off 10 to 12 mm. distant from the attachment and sew the upper half of the superior rectus and the lower to the inferior rectus. In this way we do not mutilate the vertical recti and get the same result as when using a strip from the superior and inferior. At the Missouri Pacific Hospital he had a case of a man with complete paralysis of both external recti and with retraction of both interni. The patient had not been at work, as an engineer, for seven or eight years. Dr. Wiener operated on one eye, Dr. Vincent Jones on the other, and the man is back at work as an engineer on the railroad. He has very good rotation of both right and left eyes.

Dr. Carl Eber said that Dr. O'Connor described a muscle-transplantation operation similar to the one described this evening but the paralyzed muscle is not detached from its insertion. He performed the O'Connor operation in the following two cases: Mrs. C. A., 47 years old, was injured in a cyclone in March, 1925. After recovering consciousness, she had diplopia lasting four weeks. Her vision was normal in each eye with glasses. By tropometer test, she had with the right

eye external rotation of 10 degrees, upward and downward 30 degrees, and inward 60 degrees; external rotation with the left eye was 30 degrees, while rotations inward, downward, and upward were about the same as with the right eye. X-ray examination showed possible fracture of the skull in the right frontal region. O'Connor's transplantation operation was performed on the right eye; the lateral halves of the vertical recti were sutured to the upper and lower thirds of the externus. As a result the external rotation was increased to 40 degrees with that eye. Later on, partial tenotomy was performed on the internal rectus tendon in the hope that it might improve the outward rotation, but no further improvement was obtained.

Another patient, Mrs. M. M., in September, 1930, had external rotation of 10 degrees with the right eye. After an O'Connor transplantation operation the external rotation of the right eye improved to 30 degrees. Rotation is usually improved after this type of operation.

INTRACAPSULAR EXTRACTION WITH PERIPHERAL IRIDECTOMY

DR. JOHN GREEN presented the case of A. S., a woman, aged 46 years. The patient was admitted to the City Hospital October 24, 1938, with a mature cataract in the right eye, and an immature cataract in the left eye. On October 10, 1936, Dr. Harry Woodruff, Jr., operated, removing the lens and capsule after peripheral iridectomy.

The final visual result with a +11.00 D.sph. \approx +0.75 D. cyl. ax. 15°, was 20/20. In September, 1938, Dr. Workman, not to be outdone by his predecessor, performed a similar operation on the left eye. The vision with +11.00 D.sph. \approx +0.25 D.cyl. ax. 5°, was 20/20. The cosmetic result is all that one could desire.

COMPLETE CORNEAL COVERAGE FOR ULCER IN ACUTE GONORRHEAL CONJUNCTIVITIS

DR. JOHN GREEN said that A. Y., a 14-year-old girl, was admitted October 5, 1938, for a severe purulent conjunctivitis of both eyes. Six days previous to entering the hospital pus began to flow from her right eye. The amount, little at first, increased until the eye was constantly bathed in pus. The patient lived 175 miles from Saint Louis and had been treated by a local physician. Shortly after the inflammation began in the right eye, pus appeared in the left eye; and on admission was flowing copiously from both eyes.

Physical examination was essentially negative except for the eye condition. There was no vaginal discharge. The laboratory examination of urethral-vaginal secretions were negative for gonococcus. The pus from the eye contained large numbers of gonococci. Both eyes presented a typical picture of gonorrheal ophthalmia. The cornea of the right eye showed an ulcer at the lower inner quadrant, the base of which was necrotic. There was a small ulcer in the left eye. Under local and general treatment (sulfanilamide and typhoid vaccine) the eyes improved, but the right corneal ulcer progressed and appeared to be on the verge of perforation.

On October 9th, in spite of the acutely septic condition, Dr. Workman operated. The conjunctiva was circumcised and the conjunctival flap was pulled up over the cornea by means of a purse-string suture.

The patient had immediate relief from pain. On the fifth day, the suture was removed and the cornea no longer stained. A pseudo-ptyerygium remained at the temporal side of the ulcer. The vision was excellent at the time of discharge, October 24, 1938.

Discussion. Dr. B. Y. Alvis had per-

formed such an operation in one case in which the eye was profusely discharging from gonorrheal infection. The cornea was perforating, and he did not save the eye, but the operative procedure caused no unusual reaction and brought about a more rapid closure of the perforation.

H. Rommel Hildreth,
Editor.

CHICAGO OPHTHALMOLOGICAL SOCIETY

December 19, 1938

DR. GEORGIANA D. THEOBALD, *president*

NONMAGNETIC INTRAOCULAR FOREIGN BODY

DR. CLIFFORD SULLIVAN presented N. B., a Negro aged 38 years, who was in a hunting accident when several bird-shot entered the right side of his face, one entering the right eye. The marked hemorrhage behind the lens obscured any view of the fundus. Tactile tension was normal. There was no red reflex. Vision was limited to light perception and projection. X-ray examination with a Sweet localizer indicated the foreign body to be 17 mm. back, 10 mm. to the temporal side, and 6 mm. above the center of the cornea. Operation was performed on the fifth day, with removal of the shot at the place on the sclera where a dark area was seen. Visual acuity on the fifteenth day was 20/20. The fundus cleared slowly, showing a preretinal hemorrhage in the lower periphery. This absorbed in its entirety.

IRIDOCYCLITIS ON A TUBERCULOUS BASIS

DR. BEULAH CUSHMAN said that this woman, now 20 years of age, was first seen in April, 1932, with a complaint of decreasing vision in the right eye for two years. A diagnosis of iridocyclitis on a

tuberculous basis with acquired heterochromia had been made at Michael Reese Hospital in 1931. She had been given 10 tuberculin injections. The eye remained quiet for six months.

Vision at that time was 0.4 —2 R.E., 1.5 L.E. There was an active right iridocyclitis with old and recent large mutton-fat deposits and cellular circulation in the anterior chamber. Posterior subcapsular-lens changes were present. Fundus and disc were normal. The left eye was normal. A positive tuberculin reaction was obtained and treatment was started and continued for six months, with some improvement, but many fresh and old precipitates remained.

In 1932, Schieck's work on taking blood from the vein in the arm and putting it into the anterior chamber, with at least temporary success in the treatment of chronic iridocyclitis, was published. This patient was given the first treatment in March, 1933. There was definite improvement, the precipitates all disappearing except the organized pigmented ones. The anterior-chamber puncture was repeated, and blood injected as they recurred; this was carried out five times between March 25 and June 7, 1933. After this the cellular activity in the anterior chamber disappeared, and the patient was presented before this Society in November, 1933, with vision R.E. 1.2—3, L.E. 1.5.

During the period between 1934 and 1937 she was seen regularly every four or five months. In May, 1938, she complained of right-sided early morning headache of two weeks duration, which disappeared after lunch; also some pain in the right eye. The corrected vision was R.E. 1.5., L.E. 1.5. The intraocular tension R.E. was 31 mm. Hg, with the pupil 4.0 mm. in size; L.E. 18 mm. Hg, with the pupil 3.5 mm.

A few live lymphocytes were scattered over the lower central portion of the

cornea and active cellular circulation was present in the aqueous. Pilocarpine 1 percent was ordered t.i.d. in the right eye. The Mantoux test was repeated with the purified protein derivative and the patient was positive to the second strength. Tension became normal within three days and the eye was comfortable. Bouillon-filtrate treatments were started and atropine instilled. The cellular reaction cleared within nine days and the eye has remained clear to date.

Following an automobile accident on October 15, 1938, the patient was in Cook County Hospital for four days because of suspected skull fracture, but no reaction appeared in the eye. The treatments have been continued and will be until she can take 100 mg. of the bouillon filtrate, when she will be advised to come in every six months for a Mantoux test. Should this be found positive the desensitization will be instituted again.

SCLERITIS ON A TUBERCULOUS BASIS

DR. BEULAH CUSHMAN presented a woman, aged 32 years, first seen on October 19, 1938, with an inflammatory nodular mass 15 by 20 mm. in size at the equator, temporally. The three nodules each measured 5 to 6 mm. in size, were firm, not tender, and there was intense injection of the whole eye.

The pupil was drawn up, the lower edge adherent to the anterior surface of the lens. The aqueous was dense, and diffuse posterior corneal precipitates were so numerous that the iris detail could not be seen. A dull-red fundus reflex was obtained in the upper quadrant. Vision was R.E. light perception; L.E. 1.5.

The Mantoux test was positive with second strength P.P.D., with an area of reaction 5.5 by 10.5 cm., and a central area of marked edema but no bleb formation 2.5 by 3.0 cm. The general physical examination was negative.

Treatment with Deny's tuberculin

bouillon filtrate was instituted, and the mass became smaller; two months later it was about one fifth of the size it was when treatment was started. Vision remains the same. The anterior chamber is clear except for posterior precipitates in the central area. The iris is clearly visible, with no masses; the posterior adhesion remains the same.

OPHTHALMIC PHOTOGRAPHY

DR. ROY O. RISER read a paper on this subject.

KERATOPLASTY—AN ALTERNATIVE METHOD (PRELIMINARY REPORT)

DR. W. F. MONCRIEFF read a paper on this subject which will be published in this Journal.

THE CROSS CYLINDER

DR. PHILIP A. HALPER read a paper on this subject.

Discussion. Dr. James E. Lebensohn said that Dr. Halper had given an excellent presentation of the mechanism of the cross cylinder, and showed that the test for power modified the interval of Sturm, making it shorter in one position than in the other if the strength of cylinder required change. The test for axis, however, was based on the optical transformation involved in crossing cylinders at oblique axes, and recalled the principles concerned in cylinder retinoscopy. Considering the cross cylinder as a spherocylinder with its cylinder the same sign as that in the trial frame, the essential effect of the shift would be to leave the sphere practically unmodified but to present an almost simultaneous choice of cylinder-axis shifted to one side or the other. Javal had his patient gaze at the letters while inclining the head alternately to the right and left shoulder; the eye moved instead of the cylinder. If the patient saw better with the head inclined to the right shoulder the indication

would be to move the cylinder to the right.

Southall and others showed that some error is inherent in retinoscopy; for accuracy, a subjective test is essential. Where accommodation is not active, as in cycloplegia or late presbyopia, the cross cylinder is dependable both for power and axis, but where the accommodation is active the astigmatic dial is more reliable for power, although the cross cylinder is still a valuable check for axis. For intelligent coöperation, the cross cylinder may be introduced as a "distorting glass" and the patient asked in which position the letters are less distorted. Usually only two strengths of cross cylinder are required, 0.25 for general use and 0.50 for aphakia, patients with subnormal visual capacity, or poor discrimination.

Dr. Vernon Leech remarked that he and Dr. Fowler had used cross cylinders for a good many years and found them helpful. However, the tests are subjective and consequently are liable to error. Some confusion to the patient is caused frequently by an element of brightness when the cross cylinder is used, presumably due to the effect of the minus cylinder in giving more contrast between black and white. If the patient were merely asked which position he liked better, he might give a wrong impression. More accuracy could be obtained by having him read the smallest letters that he can see on the chart, and compare the number he reads with the cylinders in the first position with the number he sees with the cylinders in reversed position.

The cross cylinder is valuable in determining the astigmatic axis. A slight turn of one-quarter diopter cross cylinders in either direction past the astigmatic axis of the eye would usually cause a more definite blurring than when regular cylinders up to 0.75 diopters were used.

Dr. Gail R. Soper pointed out that

the cross-cylinder lens is usually mounted in a metal rim with a heavy handle, thus it might break easily if dropped to the floor. This could be prevented by remounting the lens in a shelltex rim with a piece of temple bar for the handle, or bakelite might be used.

Dr. Philip Halper (in closing) stated that he did not wish to leave the impression that all that was necessary is to have the patient sit in front of a trial frame, flip the cross cylinder, and thus conclude the refraction. The instrument picks up small unrecognized astigmatic errors and points the direction for the accurate axis of the cylinder. The correcting lens is then placed in the trial frame and the patient will verify the astigmatic finding by accepting the axis that was uncovered by the cross cylinder. The abstract of Jackson's paper on "The theory and use of cross cylinders," in the November issue of the Archives of Ophthalmology, is interesting. According to him "it furnishes the best method of detecting and measuring astigmatism." Crisp states that "after 40 years use Jackson regards it as the most important single means we have for measuring the refraction of the eyes."

Robert von der Heydt.

NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

December 20, 1938

DR. EDWIN B. GOODALL, *presiding*

THE HISTORY OF ANESTHESIA IN OPHTHALMOLOGY

DR. HARRY K. MESSENGER read an interesting paper on the above subject.

INCLUSION CONJUNCTIVITIS

DR. S. H. MCKEE of Montreal said that inclusion conjunctivitis appears in

one of two well-defined forms, blennorrhoea in the newborn and follicular conjunctivitis in the adult (swimming-pool conjunctivitis). No sooner had Halberstaedter and Prowazek reported their findings of inclusions in the epithelial cells in cases of trachoma, than evidence casting doubt on the specificity of these bodies for trachoma appeared. In an infant with blennorrhoea Stargardt found what he took to be the same inclusion bodies that had been reported in trachoma. This report was followed by numbers of others establishing a special infectious disease, "Chlamydozoa blennorrhoea." Inclusion conjunctivitis, then, is a form of conjunctivitis in the newborn infant in which the severity of the infection seems to vary considerably, and in which inclusions are found in great profusion in the conjunctival cells.

In the last 55 consecutive cases of ophthalmia neonatorum seen by Dr. McKee in the Montreal area, no less than 36 were found with inclusions; in 21 cases inclusions were found alone; and in 15 others a mixed infection was present, and of this last group, 13 were due to the gonococcus.

Inclusion conjunctivitis in the adult appears in a papillary or follicular type. Involvement of the preauricular gland is quite common in both these types. Manz, in 1877, first noted in the schools of Baden an epidemic of follicular conjunctivitis which differed from trachoma in its relatively short course, absence of complication or sequelae, and its termination in complete resolution. Because of the constancy with which inclusion bodies, both intracellular and free, are found in this form of conjunctivitis, their presence and significance has aroused great interest for many years.

The inclusion bodies are composed of a matrix, in which are found initial bodies and elementary bodies. Earlier workers

regarded the inclusion bodies as protozoa and pictured them as varying stages of an elaborate life-cycle. Later they were believed to represent cellular degeneration products, and other processes consequent on the attack of the virus.

The virus etiology of inclusion blennorrhoea seems to have been established inasmuch as the inclusion bodies of this inflammation are similar to those found in psittacosis, and are of the same nature as those found in vaccinia variola and other recognized virus diseases. It arises by way of the genital tract of the mother, in whom the infection is, strictly speaking, venereal in origin.

Probably it is the diversity of the views regarding the make-up of the inclusion body that makes its study so attractive. Whatever their nature, there is no gainsaying the fact that they are constantly present in inclusion conjunctivitis. Of great importance, too, is their presence both in animals and humans who have been infected with filtrated material. "Whatever the structure of inclusion bodies may be, their presence in tissue is a sure sign of infection." In an inflammatory exudate, regardless of the nature of the irritant, the polymorphonuclear neutrophils are the first cells to arrive, and the most active phagocytes of the body. Yet, in spite of this fact, in inclusion disease of the conjunctiva, at any rate, it is the epithelial cells which become the active phagocytes. Questions still unanswered are: What special condition is present to produce this effect? Is the make-up of the inclusions of inclusion conjunctivitis and the identity of the virus a problem in virus disease, or in intracellular reaction or degeneration? Will further enlightenment about the "lag stage" of bacteria solve the problem?

Trygve Gundersen,
Secretary.

COLORADO OPHTHALMOLOGICAL SOCIETY

December 10, 1938

DR. MELVILLE BLACK, *presiding*

GLAUCOMA ERRORS

DR. HARRY GRADLE, of Chicago, presented Elschnig's classification of glaucoma as a practical one on which to base therapy. Acute uncompensated glaucoma is best treated by an iridectomy if the case is seen within the first 48 hours. If surgery is delayed longer than that, peripheral anterior synechiae will have formed, and some type of filtering operation will be necessary. Surgery on acute uncompensated glaucoma should be performed under general anesthesia. An iridectomy should be made under a conjunctival flap. The iris is grasped with forceps and cut with small snips of the scissors so that the root excision is ragged. A peripheral iridectomy is just as satisfactory as a complete iridectomy. From 25 to 45 degrees of angle should be freed. A mydriatic should be used postoperatively only if the anterior chamber fills with blood.

In any glaucoma operation a strong miotic must be used in the eye that is not operated on lest the excitement and bandaging provoke a glaucomatous attack in that eye. The likelihood of eventual increased tension in the fellow eye is sufficiently strong that a preventive iridectomy on the normal eye is to be advised in patients with acute glaucoma. If this is not done a miotic should be used when the patient retires or if he is under an emotional strain.

Compensated glaucoma may be treated

either medically or surgically, depending upon the case. The tension curve is very important in establishing a diagnosis and in directing treatment. Tension should be taken every three hours from 7 a.m. to 10 p.m. This is best done by a nurse specially trained in the procedure. At times it is of value to have the nurse follow the patient around during the day to notice the effect of daily activities upon the tension. A strong miotic should not be used too frequently as it leads to the production of lens and vitreous opacities. Glaucoma is surgical if eserine or 2-percent pilocarpine is necessary to control the tension. The home use of adrenalin to control tension is unsafe. Pilocarpine solutions easily become contaminated and may then produce a conjunctivitis. It is well to instruct the patient to boil the solution every 10 days.

Cyclodialysis may be used in that type of compensated glaucoma that is just beyond the control of miotics. It is successful in about 80 percent of these cases. It is unsuccessful in more advanced compensated and in all uncompensated cases. In performing a cyclodialysis, the ciliary body should be separated from the sclera in about one third of its extent. If this is done properly, there is always a hemorrhage into the anterior chamber. If the cyclodialysis is done inferiorly, fibrin and blood will obstruct the drainage. For this reason, it is best to do the operation in the upper and outer quadrant and keep the head elevated for 24 hours. Homatropine is to be used until the blood is absorbed, but atropine is dangerous.

John C. Long,
Secretary.

AMERICAN JOURNAL OF OPHTHALMOLOGY

Published Monthly by the Ophthalmic Publishing Company

EDITORIAL STAFF

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Author's proofs should be corrected and returned within forty-eight hours to the *Manuscript Editor.* Twenty-five reprints of each article will be supplied to the author without charge. Additional reprints may be obtained from the printer, the George Banta Publishing Company, 450-458 Ahnaip Street, Menasha, Wisconsin, if ordered at the time proofs are returned. But reprints to contain colored plates must be ordered when the article is accepted.

WEVE ON RETINAL DETACHMENT

Gonin's epochal advocacy and practice of an operative treatment for retinal detachment, successful beyond all procedures previously attempted, has been followed by a succession of brilliant experimentation and technical improvements. Gonin, whose preliminary studies were published in 1919 and 1920, was tolerant, but not altogether enthusiastic, as to the claims made regarding other procedures such as diathermy and electrolysis. To the time of his death he continued to treat his cases chiefly by cautery puncture. Today, flat diathermy and penetrating diathermy lead the field.

It is natural that the surgical treatment of this ocular calamity should have been

undertaken extensively in most ophthalmic clinics and by a number of well-trained and eager surgeons, in every civilized country. Furthermore, in spite of failures, the spectacular atmosphere surrounding the attempt to cure a condition previously considered hopeless has excited the lively interest of every intern and surgical assistant in institutions where relatively significant numbers of cases were available.

Surgical ambition and enthusiasm have induced many of those who witnessed such operations to feel that they were qualified and entitled to undertake the same procedures in communities in which they were practicing or in which they subsequently began to practice. Unfortunately, the results of such disciple-

ship have not always been creditable to the surgery of retinal detachment.

There is perhaps no other field of activity to which the phrase "a specialty within a specialty" can be more suitably applied than the treatment of retinal detachment. Hardly any other malady calls for such detailed and time-consuming study before surgery is undertaken, or such meticulously patient and thorough technique in the performance of the necessary operation. It would be foolish to maintain that the capacity either for prolonged and tireless study of the case, or for intricate precision in technique, is possessed in equal measure by every ophthalmic surgeon, even though his training may have been of the best. Thus it becomes doubtful whether more than a few should undertake the surgery of this condition, especially when we consider that the number of cases is too small to provide many surgeons with adequate experience.

(From the merely mercenary point of view it may be recognized that large fees are only exceptionally available, and that the financial rewards are relatively insignificant. The time and effort consumed are such as to justify the saying attributed to a prominent operator, to the effect that if one succeeds in being recognized as a retinal-detachment surgeon he will have to give up the rest of his practice.)

For every ophthalmologist, statements concerning retinal detachment by a clinician who has himself originated important surgical procedures, who can report operations upon over one thousand patients, and who claims to cure ninety percent of recent cases and eighty percent of unselected cases, must be regarded as eminently worthy of attention.

Weve, of Utrecht, Holland, who mentions that retinal detachment was formerly responsible for thirteen percent of all blindness in Holland, makes such claims

(*Klinische Monatsblätter für Augenheilkunde*, 1939, volume 102, page 609). But he urges that no one should undertake operation for this condition, especially upon an only eye, unless he is thoroughly qualified for the responsibility, and commands adequate and expert assistance.

Every ophthalmic surgeon may theoretically possess the legal right to perform the operation for retinal detachment, and every surgeon must determine for himself whether he is morally justified in such an enterprise. But it may be judicious not to wait for the patients to decide this question.

The results tabulated by Weve show the highest percentage of successes to have occurred in three types of case, those with tears at the ora, and those in which the larger part of the detachment was "above or below the horizontal, respectively." These groups also include almost four fifths of the total number of patients operated upon. In Weve's hands the cases with tears at the ora yielded one hundred percent of successful results, the cases with the largest part of the detachment above the horizontal eighty-seven percent, and those with the largest part of the detachment below the horizontal seventy-four percent of successes.

Uniformly good results were also obtained (during the years 1935, 1936, 1937, and 1938) with the much rarer cases of hole in the fovea. For these last, Weve was at first disposed to think that Lindner's undermining method was superior to the use of diathermy. But uniform success in the last five years causes him to declare that the diathermic technique is just as satisfactory as the more difficult undermining method.

Diagnostically, Weve insists on the necessity for powerful illumination and exhaustive ophthalmoscopic examination through the widely dilated pupil, with detailed attention to the retinal periphery.

Every ophthalmologist, says Weve,

should learn to draw the eyeground; not necessarily with artistic skill, but in such a way as to show all important details. Weve attributes much of the success with which retinal detachment has been handled in his clinic to the fact that no operation has been performed unless every essential detail of the fundus had previously been shown in a drawing. It is necessary to indicate the whole vascular system, together with the most important retinal folds and differences of level, as well as pigment masses and atrophic spots. The attached retina and vessels are shown in red, the detached retina and obliterated vessels blue, choroidal scars yellow, pigment black, and vitreous opacities and bands green. Weve urges that there is no better way to discover tears than through this habit of accurately drawing and mapping the fundus.

Weve's surgical objective is that of Gonin, "closure of the tear by direct attack." "Walling-off" is resorted to only in the rare cases where no tear can be found. The grounds for avoiding this procedure, if possible, are the incidental loss of functional retina, very intensive coagulation with the formation of star-shaped retinal folds, the danger of producing new tears, and diminished possibility of healing. Walling-off by diathermy is described as being not infrequently an "affirmation of poverty" (testimonium paupertatis)—in other words the operator admits thereby that he has not at his disposal the proper instrumentarium or the patience necessary to find and localize the tear.

Further details of Weve's technique include control by indirect ophthalmoscopy during the operation and also during convalescence, combined application of surface and perforating coagulation, and carefully calculated suction or expression of fluid with a view to bringing the region of the tear into contact with the ocular wall during the operation. A surgeon

should not intentionally contemplate operating in several stages, since an eyeball previously operated upon often reacts differently and less favorably to further interventions.

Weve opens his essay with description and illustration of some interesting technical devices, among which are an arm sling to facilitate prolonged examination by the indirect method, a wire "tunnel" to enable the patient to breathe comfortably during operation, an intensive lamp for diagnostic examination of the fundus and for localizing during the operation, and a head band with protective covering for the operator's second eye while drawing the fundus.

W. H. Crisp.

THE ACADEMY MEETINGS IN CHICAGO

The American Academy of Ophthalmology and Otolaryngology convened at the Palmer House, in Chicago, on Sunday, October 8th, for its forty-fourth annual meeting. This hotel lends itself better than any in the country to the activities of the Academy. There is really only one other entirely suitable and that is the Waldorf in New York, and for this reason these two cities are particularly desirable for Academy meetings. However, there is serious objection to having the meetings in only two cities. Better to put up with inconveniences of housing in two adjoining hotels and visit different cities even though attendance may be smaller and the facilities not quite so perfect. As it happens, because of the uncertainty of the international situation and the strong desire of several cities to entertain the Academy at an early meeting, the location for the next meeting was not decided upon in Chicago, but will be announced in an early issue of the Bulletin.

One of the interesting features of the

meeting was the formation of an Academy honor society, to be made up of past presidents and a few others whom it is desired especially to recognize. Dr. Joseph Beck was elected first president. This honor society will act as an occasional advisory body for the Academy, its purpose being to utilize the experience of past presidents as well as to maintain their interest in the Academy.

A unique event was the dinner in honor of the founding of the American Board of Ophthalmology 25 years ago. Appropriate addresses were made by Dr. Lancaster and Dr. Ellett, and a handsome plaque was presented to Dr. Edward Jackson.

On Monday morning three extremely interesting papers were read at the joint session on hypertension. On Tuesday evening a dinner meeting of the Teachers' Section was devoted to a consideration of extension courses. It was recommended that these be undertaken, and a committee was appointed for this purpose. Later this recommendation was accepted by the Council, so that probably within the year these courses will be introduced. Quite obviously this is not the ideal method of instruction, but it is a beginning, and certainly at a time when it is not yet possible to provide residencies with basic training for all those desiring them. Instructional correspondence courses will help as a stop gap. They will also serve older men who wish instruction and have not the time to attend long basic courses, yet are not satisfied with merely the condensed lectures obtainable in short courses.

The regular sections and the motion-picture section offered some excellent material. The scientific and the commercial exhibits were very good. It was decided to continue the scientific exhibits annually or as often as desired, and a program committee was appointed to provide for the continuance of this feature. Every

year these exhibits improve; the newer refinements of colored photography are an important reason for this.

Entertainments were of a high order and strictly pertaining to the Academy.

To say anything of the Section on Instruction is unnecessary, as it is always a high light of the Academy meeting.

Dr. Frank Spencer was chosen president-elect and Dr. Arthur W. Proetz first vice-president. Probably no one in this country has made the original contributions to otolaryngology that Dr. Proetz has made, and this is a well-deserved honor. Dr. Spencer's election seems equally appropriate, and under Dr. Frank Brawley's and their leadership, the next meeting of the Academy should be a very successful one.

LAWRENCE T. POST.

BOOK NOTICES

TRANSACTIONS OF THE AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY. Forty-third Annual Meeting, 1938. Clothbound, 447 pages, illustrated. Omaha, 1939.

The Transactions of the forty-third annual meeting of the American Academy of Ophthalmology and Otolaryngology was dedicated to Dr. John Finch Barnhill, president of the American Academy of Ophthalmology and Otolaryngology in 1932, a distinguished teacher of ophthalmology for many years. The address by the president, Dr. Harry S. Gradle, was characteristic of the author in its forward-looking program containing the suggestion of a plan for home instruction. This idea was accepted by the Academy and the plan should soon be functioning.

The first half of the Transactions is devoted to otolaryngology, the latter half to ophthalmology.

The opening paper of the ophthalmic section is on the operative treatment of

radiation cataract. Reese concludes that this type of cataract, which tends to show a proliferation of the epithelium under the anterior capsule into a metaplastic fibrous layer, should be operated on by the intracapsular method of extraction. The capsule is strong and capable of withstanding the necessary traction. On the other hand, extracapsular extraction is contraindicated because of the lens epithelium which may continue to proliferate to form dense fibrous tissue.

Bernard Samuels has given a complete and beautifully illustrated discussion on ossification of the choroid. He concludes that there is practically no danger of sympathetic ophthalmia from eyes so ossified. Ossification or bone formation can scarcely occur in sympathetic ophthalmia because of the destruction of uveal tissue. He further stated that there was no special liability of sarcoma developing in shrunken, ossified globes. Numerous other important facts were brought out. A detailed study of the paper is well worth while.

Ocular papillomata were discussed by R. E. Windham. The description of the successful treatment with the thermophore was a feature of the paper.

Since the introduction of homatropine-benzedrine cycloplegia, its use has rapidly become popular. Lyle S. Powell reported on it further and concludes that it is a valuable method that might be substituted for the usual homatropine routine. It appears to be equally efficacious and has the great advantage of being transitory, so that accommodation is recovered by the following day, even in adults.

An unusual subject was that discussed by Moacyr E. Alvaro of São Paulo, who described the deleterious effect of snake venom on the eyes, and its use in ophthalmology. At present the latter seems rather in the experimental stage, but possibly the future may prove it of value.

James W. White and Harold W. Brown

pointed out the frequency and importance of vertical anomalies in muscular imbalances. A thorough study should be made of these before attempting the correction of lateral deviations and in many cases it is advisable to operate on the vertical muscles before operating on the lateral.

A new method for the transplantation or implantation of the lacrimal sac in chronic dacryocystitis was presented by William H. Stokes. The major advantage was its simplicity of performance; although involving the nose, very little nasal manipulation was necessary. It was thought that ophthalmologists not specially familiar with nasal procedures could safely perform this operation.

V. Reeves Hurst considered oculoglandular diseases with special reference to tularemia and Parinaud's conjunctivitis. He reported 23 cases. No difference could be observed between those in which the leptothrix was found and those in which it was not found. Two cases of oculoglandular tularemia were easily distinguishable from cases of Parinaud's conjunctivitis by the clinical course and agglutination tests.

Lawrence T. Post.

L'OEIL ET LES MALADIES PROFESSIONNELLES (MALADIES DU TRAVAIL). By Ch. Coutela. 612 pages with 43 illustrations. Paris, Masson et Cie, 1939.

This book is encyclopedic in its scope. It covers the field in painstaking detail, every conceivable toxic agent being given ample consideration. After the presentation of a general historical background and a definition of occupational diseases, the subject matter is divided into five main sections. The first deals with vapors, gases, and powders. The second considers radiant energy: heat, light, radium emanations, and X rays. In the third part are

considered the various intoxications, such as by lead, hydrocarbons, and alcohol. The fourth part takes up infectious and parasitic agents. The roles played by fatigue and changes in the atmospheric condition are considered in the fifth part. Each section has its own particular historical introduction and a bibliography. Finally there is a chapter on medico-legal aspects of occupational diseases.

This volume will be of assistance to all ophthalmologists who can read French, whether their practices are industrial or not. In this connection it may be said that one need not know much French to make use of the material in this book. The descriptions are so logical and well outlined that even a beginner could follow most of them quite satisfactorily. The only criticism that one might make is the paucity of illustrations. However, completely illustrating this work would fill at least another volume and make the cost prohibitive.

Frederick A. Wies.

CORRESPONDENCE

EUROPEAN CLINICS

Dr. Alston Callahan sends us the following description of a recent pilgrimage to various European eye clinics:

July 29, 1939.

In London the surgical technique of Ida Mann was noteworthy for its speed with no sacrifice of meticulousness; for example, she does an Elliot trephining in about five minutes. Miss Mann has a clinic for contact-glass fitting, and told me that the English government was buying them in large numbers for those soldiers injured in the World War by mustard-gas burns of the cornea. The companies that make them have about 600 models and select the one closest to the proper fitting and modify it as is necessary. As soon as they are success-

fully fitted, the government stops their pension. Mr. Neame showed me, among other cases, a three-year-old girl with an enormous chalazion, which had recurred despite proper surgery. After some investigation, it was found that she had a strongly positive Wassermann, and prompt antiluetic treatment, just instituted, was curing the disease. Mr. Neame's surgery was instructive to watch, as was also that of one of the younger men, R. W. Rycroft. Rycroft has done a number of corneal grafts, and uses a large trephine to cut a complete section of the cornea. One of his very interesting cases was that of an infant with bilateral glioma; one eye had already been removed, and he was attempting to stop the neoplasm with diathermy, instead of radon seeds, which he had used previously.

In Paris the Society for Development of Relations with Visiting Doctors sets a standard hard to equal. Their friendly help, the daily mimeographed bulletins of operations mailed out to the hotels, leave one very prejudiced in their favor. Prof. Elliot Terrien, at Hotel Dieu, uses Elliot trephines for most of his glaucoma cases; he removes cataracts underneath an undivided conjunctival flap, pushes from below against the lower limbus with the lower shaft of the eye speculum. Dr. Victor Lagrange does all cataracts, except those he designates as "white," by intracapsular method, and uses a forceps and a "pusher" of his own. He has his assistants instill cocaine and adrenalin into the eye every few minutes for an hour before he begins the procedure of extraction; and he believes that the collapsing of the cornea and the resting quietly of the vitreous is due to this anesthesia. He admits a slight escharotic action on the corneal epithelium, but states that in his experience this recovers in a few days. In dealing with the skin, as for example after removal of a lacrimal sac, he sutures only subconjunctivally and allows the

surface tissue to grow together without sutures holding it.

In Zürich Professor Vogt was most gracious and hospitable. His residents must stay four years, having already had, of course, the six years required to secure a degree. His first motto in teaching is "Do nothing that will harm the eye." Because a resident once caused a lenticular opacity by improper manipulation of a keratome in doing an iridectomy, all such procedures must now be done with a knife, slicing down on the limbus until the anterior chamber is reached, the iris allowed to come into the wound and divided; they may not reach down into the anterior chamber for it. I had never before seen Vogt's tongue-shaped instrument for X-raying the eye for foreign bodies; after the conjunctiva is anesthetized, it is pushed securely into the inner canthus, the X-ray tube being placed at right angles to the plate, which fits on the instrument. Professor Vogt's pathologist handles about 7,000 eyes annually, and was kind enough to show me one of the prizes of their collection—sections of an eye in which had occurred a recent retinal separation. The patient had been killed shortly after the onset of this condition, and after death the eye was secured. The hole can be easily demonstrated, and, incidentally, Professor Vogt never operates on a retinal separation unless the hole can be found. He does not teach his students the intracapsular method, since he believes only those few specially gifted should employ it.

In Basel I found Prof. Alfred Gigon a warm host. He showed me a recent edition of the *Ars Medici*, which, as

previously mentioned in the *Journal*, is now published in Switzerland. He referred me to Professor Bruchner, who has an excellent eye clinic in this city.

While there were many changes in Vienna and in the clinics, Lindner's and Miller's clinics seemed to be in full operation. I had never been to Vienna before, so could not compare it with its previous status. Many classical procedures were performed while I was there.

In Budapest, the dean of ophthalmologists is Dr. Emile de Grosz, now retired. Dr. Blascovicz was appointed to succeed Dr. Grosz as professor of the Hungarian Eye Clinic, but unfortunately died last year. At the present time, official appointment has not been made, but Dr. Grosz's son has achieved much in his own right. Prof. Dr. Zoltan Toth is quite prominent in the work of the clinic; he believes fervently in a suture through the sclera to hold the corneal flap after cataract extraction. They take great pride in plastic surgery here after Blascovicz's techniques; they use horsehair and human hair for suture material. In contrast to Professor Vogt, they believe very strongly in intracapsular removal of cataracts and it is very remarkable to witness how much "push" they use, how little "pull" in the procedure.

I was not a little surprised and pleased to see in how many of these foreign clinics, the *American Journal of Ophthalmology* is read and appreciated. Professor Gigon especially seemed to appreciate your [Dr. Crisp's: ed. note] reference to him in a recent issue.

(Signed) Alston Callahan, M.D.

NOTE

Two typographical errors appeared in the editorial department of the September issue; namely, on page 1030 Sudeten should be so spelled, and on page 1033 the

group before which Dr. Bielschowsky's series of lectures was given was the Mid-Winter Clinical Course of the Research Study Club of Los Angeles.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

ASSISTED BY DR. GEORGE A. FILMER

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

- | | |
|--|--|
| 1. General methods of diagnosis. | 10. Retina and vitreous |
| 2. Therapeutics and operations. | 11. Optic nerve and toxic amblyopias |
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10

RETINA AND VITREOUS

Gray, R. J. Retinal hemorrhages after transfusion. *Amer. Jour. Ophth.*, 1939, v. 22, Sept., pp. 979-984.

Guist, Gustav. Amelioration of visual function of damaged retina. *Klin. M. f. Augenh.*, 1939, v. 103, July, p. 77.

Under minimal nutrition, in spite of the great lability of the retinal cells, they may remain living without functioning. If this condition lasts too long the cells die. Latzel has shown that specific substances of an organ may increase its function. Guist confirmed this by intracutaneous injections of "xipoid retinale," a substance obtained from healthy retinæ of young animals, and used in intraocular diseases where decrease of vision is caused by underfunction of the retinal cells. Vision was improved in flat detachment of the retina (not completely reattached by operation), senile degeneration of the macula, sclerosis of the choroid, drusen of the macular region, and occasionally in hemorrhages from hypertension, dia-

betes, and renal disease. Results are shown in ten detailed clinical histories. Visual improvement was maintained by repeated injections. C. Zimmermann.

Klien, B. A. A case of so-called Oguchi's disease in the U.S.A. *Amer. Jour. Ophth.*, 1939, v. 22, Sept., pp. 953-955.

Nicolacopoulos, J. An unusual ophthalmoscopic picture. *Bull. Soc. Hellénique d'Opht.*, 1939, v. 8, Jan.-March, p. 43.

A 16-year-old girl with greatly reduced vision showed a large macular lesion with other changes extending from the disc over the upper part of the retina. The condition was thought possibly to be due to a separated retina which had reattached.

George A. Filmer.

Saidovski, A. G. Pigmented spots in the fundus. *Viestnik Opht.*, 1939, v. 14, pt. 6, p. 74.

Examination of a patient with retrobulbar neuritis revealed a dark semilunar area adjacent to the disc and

measuring 4 by 6 disc diameters. Pigmented spots in the fundus are congenital and probably caused by disturbance in intrauterine development. (Illustrations.) Ray K. Daily.

Schneider, Karl. **Embolism of the central retinal artery and its treatment.** Klin. M. f. Augenh., 1939, v. 103, July, p. 93.

A woman suddenly developed a dull feeling in the whole head and then found she could not see with the right eye. In her early youth a heart disease had been diagnosed. She presented the typical changes of embolism of the right central retinal artery with extensive circumpapillary edema. Following immediate digital massage and retrobulbar injection of atropine, vision rose to 5/15 eccentrically the next day. A large grayish-white embolus was seen in the lower half of the right inferior-nasal branch. Under continued massage, retrobulbar atropine injections, and intramuscular injections of eupaverine, on the third day some blood could be seen as a thin thread flowing past the embolus. The treatment was continued and vision returned to normal in about a month.

C. Zimmermann.

Stasinska, J. **Cysts of the retina.** Klinika Oczna, 1939, v. 17, pt. 3, p. 386.

A woman 27 years old came to the clinic with a history of sudden blindness. On examination she was found to have a retinal detachment, and close to the ora serrata in the temporo-inferior segment of the eyeball was seen a large transparent cyst 4 by 6 disc diameters in size. A diathermocoagulation was performed; during the operation the cyst ruptured and the retina became reattached. Ray K. Daily.

Tatár, Josef. **Retinitis pseudonephritica and periarteritis retina following erythema nodosum.** Klin. M. f. Augenh., 1939, v. 103, July, p. 84.

Ocular manifestations following erythema nodosum included small vesicles and papules of the conjunctiva, scleral infiltrations, and hypopyon iritis with opacities of the vitreous. Tatár describes an unusual case of periarteritis and retinitis pseudonephritica in a man of 39 years suffering from erythema nodosum. The affection consisted of exudations around the central retinal artery, preretinal and retinal hemorrhages, and formation of a star figure. The hemorrhages recurred several times simultaneously with the erythematous relapses and later uveitis set in. Tuberculotoxic allergy was demonstrated and the prognosis was unfavorable on account of diminishing vision with the frequent relapses. The case did not yield to the usual tuberculin therapy, but reacted well to rubrophen injections. C. Zimmermann.

Tooke, F. T., and Nicholls, J. V. V. **Changes in the fundus oculi following splanchnectomy for malignant hypertension.** Canadian Med. Assoc. Jour., 1939, v. 41, July, p. 21.

A series of fifteen cases of malignant hypertension in which a splanchnectomy was done is reported. From every standpoint, including that of the fundus oculi, 2 were cured, 3 markedly improved, 8 moderately improved, one unchanged, and one definitely worse. Although the effect on the blood-pressure level was in most patients disappointing, the improvement in the fundus findings and visual acuity was in several cases very marked. Thirty-seven percent of the cases had no fundus changes. T. E. Sanders.

Trantas, A. Retinal cyst simulating a detachment. *Bull. Soc. Hellénique d'Opht.*, 1939, v. 8, Jan.-March, p. 49.

A 42-year-old man presented a smooth elevation of the retina in one quadrant between the equator and the ora serrata. The retina and subretinal fluid were transparent, and choroidal vessels could be seen with the diaphanoscope. Vision was good and the condition had remained stationary for eight months. George A. Filmer.

Volokitenko, A. E. Osmotherapy in myopic chorioretinitis. *Viestnik Opht.*, 1939, v. 14, pt. 6, p. 22. (See Section 7, Uveal tract, sympathetic disease, and aqueous humor.)

Walker, C. B. Combined galvanodiathectic unit for surgical treatment of separated retina. *Trans. Sec. on Opht.*, Amer. Med. Assoc., 1938, 89th mtg., p. 304.

This unit combines diathermy and galvanic current, delivered through one cord and one indifferent electrode pad, and controlled by means of a twin foot-switch. Outlets for head light and ophthalmoscope are also provided. (One illustration.) George H. Stine.

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Agnello, Francesco. Toxic amblyopia from felix mas. *Rassegna Ital. d'Ottal.*, 1939, v. 8, March-April, pp. 210-221.

Following the discharge of a tapeworm, a 28-year-old soldier was given a dose of 40 to 50 grams of felix mas. Within four hours unconsciousness developed and persisted for 36 hours. Upon regaining consciousness the patient manifested complete bilateral blindness which did not respond to any treatment, including the use of acetyl-

choline. Ophthalmoscopically there was the faintest retinal edema, with normal-appearing nerve heads and slight contraction of the arteries. Gradually atrophy of the nerves developed. The author gives a review of our knowledge of toxic amblyopia caused by this drug. (One figure.) Eugene M. Blake.

Besrukova, M. I., and Ochapovskii, S. V. Optic-nerve disease caused by plasmocide poisoning. *Viestnik Opht.*, 1939, v. 14, pt. 5, p. 60.

Plasmocide in toxic doses is a neurotropic poison, attacking the central nervous system and causing a toxic encephalitis. The optic nerves are involved early with complete loss of vision. Some restoration of vision follows but the prognosis is grave, the final visual acuity being 0.1 or less. Oculomotor and pupillary disturbances are absent. The disease is not fatal and histopathologic examinations have not been available. The author believes that large toxic doses involve the ganglion cells of the gray matter, and long-continued small doses attack the peripheral nerves. Ray K. Daily.

Dieffenbach, Pierre. Tuberculosis in the optic nerve and disc. *Ann. d'Ocul.*, 1939, v. 176, July, pp. 497-517.

A 23-year-old male with a family history of tuberculosis and previous history of serofibrinous pleurisy presented himself for eye examination. In the right eye there was slight edema of the disc with some dilatation of the vessels. Vision was 0.7. In the left eye there was no light perception and the disc was congested and swollen with many vessels in the edema. There were several hemorrhages and exudates around the disc. The ocular lesions progressed slowly and in a month the patient was brought in for autopsy which disclosed

tuberculosis of the lungs, peritoneum, meninges, and frontal lobes. Histologic examination of the eyes revealed in the right eye papilledema accompanied by lymphocytic infiltration. There was similar lymphocytic infiltration in the optic-nerve sheath. The left eye showed a caseous mass in the intrascleral portion of the optic nerve. The retina was edematous and detached as far forward as the equator. The author believes that the papilledema in the right eye was a result of increased intracranial pressure, but that the lesion in the left eye was a specific tuberculous involvement. The literature is reviewed extensively.

John M. McLean.

Fischer, Franz. The question of so-called permanent choked disc. *Klin. M. f. Augenh.*, 1939, v. 102, May, p. 656.

A woman of 44 years with a tumor of the hypophysis had choked discs which had shown no ophthalmoscopic or functional change in five years. The choked discs of another woman of 37 years with angioma capitis showed no change in 14 years. These cases confirm the observation of Pick that choked disc due to intracranial pressure may remain unchanged for years.

C. Zimmermann.

Herrenschwand, F. Participation of the optic nerve in postvaccinal encephalomyelitis. *Klin. M. f. Augenh.*, 1939, v. 102, June, p. 815.

In 1931 (*Beitr. path. Anat.*, v. 87, p. 161) the author published his observations on diseases of the optic nerve in encephalitis after vaccination, a complication which apparently had been previously overlooked. He now reports three cases with autopsy findings, according to which the optic-nerve involvement is interpreted as acute retrobulbar neuritis, clinically resembling

that seen in myelitis, multiple sclerosis, and encephalitis lethargica. Histologically the postvaccinal type differs from the others in showing proliferation of glial cells in continuous seams around the veins. C. Zimmermann.

Kosmin, V. I. The treatment of optic atrophy caused by plasmocide with retrobulbar injections of atropine and strychnine. *Viestnik Opht.*, 1939, v. 14, pt. 5, p. 34.

A tabulated report of ten cases of optic atrophy, five of which were caused by plasmocide, shows that the effect of atropine and strychnine is superior to that of atropine alone. Ray K. Daily.

Machado, N. R. Postinfectious optic neuritis and acute iridocyclitis. *Trabalhos do Primeiro Cong. Brasileiro de Opht.*, 1936, v. 2, pp. 517-521.

The author discusses briefly the pathogenesis of the optic neuritides which develop as sequelae of different exanthemata. Two cases are reported, one of acute optic neuritis following measles, the other of acute iridocyclitis following inflammation of the parotid gland. The first case, in which vision diminished considerably, recovered completely after treatment with foreign protein, saline laxatives, intravenous calcium injections, nasal disinfection, acetyl chloride, strychnine, iodides, and light baths. The second case recovered after treatment with mydriatics and hot applications. Ramon Castroviejo.

Redslob, M. E. The teeth and the optic nerve. *Ophthalmologica*, 1939, v. 97, June, p. 133.

The author reports his clinical experiences with a patient in whom he believes an attack of retrobulbar neuritis was caused by a dental infection. Both nerves were involved at intervals

of two years and each time recovery immediately followed the extraction of a tooth that had an apical granuloma. The hypothetical mechanism of the transmission of the infection is discussed and the author emphasizes two possibilities: (1) angiospasm in a retrobulbar part of the optic nerve as a result of reflex irritation caused by the affected tooth, and (2) focal infection initiating an allergic reaction in the optic nerve. F. Herbert Haessler.

Smith, E. G. Unilateral papilledema; its significance and pathologic physiology. *Arch. of Ophth.*, 1939, v. 21, May, pp. 856-873.

The author reports twelve cases to illustrate unilateral papilledema from intraocular, intraorbital, intracranial, and systemic causes. The papilledema may not be homolateral and cannot be depended upon for localization. Patients presenting unilateral papilledema should be subjected to a study including measurement of intraocular pressure, exophthalmometer reading, neuroophthalmic examination with spinal-fluid studies, and roentgen examination of the head including the optic foramina and the sinuses. Smith discusses the relation of intraocular pressure to papilledema, particularly in arterial hypertension, and the yielding of the lamina cribrosa, with direct compression of the vein and elevation of the retinal venous pressure. (Bibliography.) J. Hewitt Judd.

Sobanski, Janusz. A slate-gray optic disc. *Klin. M. f. Augenh.*, 1939, v. 102, May, p. 704.

In 1914 the right eye of a man of 51 years had been enucleated for absolute glaucoma. In 1920 the sight of the left eye suddenly failed on account of de-

tachment of the retina which was not improved by injection of salt solution. An operation performed in 1934 was without result. There was intense horizontal, and occasionally rotatory, nystagmus. The optic disc was slightly oval with sharp borders and of slate-gray color. The blood vessels at the peripheral part of the disc were well visible, but became centrally indistinct on the dark disc. There was a slight physiologic excavation. A peripapillary flat detachment became greater toward the periphery and showed some fine hemorrhages. Repeated operations for the detachment were without effect. Only two such cases have been published. With regard to the slate-gray disc, the author adopts the opinions of Hirschberg and Foerster of an anomaly of development belonging to the group of melanoses of the optic nerve.

C. Zimmermann.

Strong, J. C., Jr. Case of bilateral optic atrophy following insect bite. *Amer. Jour. Ophth.*, 1939, v. 22, Aug., pp. 906-907.

Tarlovskaja, S. I. Prolonged choked discs of malarial etiology. *Viestnik Opt.*, 1939, v. 14, pt. 6, p. 68.

A woman 35 years old, with malarial serous meningitis, had bilateral choked discs with normal vision and enlarged blind spots. During a three-month period of observation there was practically no change in the appearance of the fundus, while the general symptoms fluctuated under treatment. The literature contains seven reports of choked disc with meningeal symptoms of malarial etiology; in all there was improvement and final recovery under repeated spinal punctures.

Ray K. Daily.

12

VISUAL TRACTS AND CENTERS

Dejean, C., and Ferrie, J. **Etiology of visual hallucinations.** *Arch. d'Opht.* etc., 1939, v. 3, June, p. 511.

Three patients convalescing from ocular operations presented all varieties of visual hallucinations: micropsic, microteleopsic, lilliputian, macropsic, monstrous, and normopsic. The hallucinations disappeared when the bandages were removed. This indicated that the functional excitation of the cerebral cortex was initiated by the suppression of vision, and not by images originating in the retina, since the latter is but a conducting organ. (Bibliography.)

Derrick Vail.

Koslowski, Bogumil. **Several cases of pituitary and presellar tumors.** *Klinika Oczna*, 1939, v. 17, pt. 3, p. 360.

Four cases of pituitary tumor are reported. One patient, a boy eight years old, came to the hospital with vision reduced to light perception and symptoms of raised intracranial pressure. Following two spinal punctures vision improved sufficiently to permit perimetry, and a bitemporal hemianopsia involving the fixation points was then demonstrable. X-ray therapy led to marked improvement of vision but the case ended fatally. The second case, a woman 26 years old with bitemporal hemianopsia, headache, and vomiting, also improved under X-ray therapy but died seven months after treatment was discontinued. The third case, a girl 19 years old, had choked discs, and an intracellular tumor was demonstrated by X-ray. The patient recovered under X-ray therapy. The fourth case, a man 54 years old with a bitemporal hemianopsia and complete destruction of the sella turcica, was treated by X ray and

radium. A week after the third exposure to X ray he developed hypotony and retinal detachment of the left eye.

Ray K. Daily.

13

EYEBALL AND ORBIT

Allen, T. D. **Revised technique for bone implant.** *Amer. Jour. Ophth.*, 1939, v. 22, Aug., pp. 902-903.

Blake, E. M., and Mason, D. **Chronic orbital osteomyelitis caused by typhoid bacillus.** *Amer. Jour. Ophth.*, 1939, v. 22, Sept., pp. 1019-1021.

Krause, A. C., and Stack, A. M. **Citric and malic acids of the ocular tissues.** *Arch. of Ophth.*, 1939, v. 22, July, pp. 66-72.

Because there is a definite need for inquiry into the organic-acid metabolism of the eye, this investigation was made into the quantities of citric and of malic acids of the ocular tissues. The method of analysis is described and the results presented in a table. The ratio of citric acid to malic acid was 1 to 10 in each ocular tissue. The metabolism of these acids in relation to the eye is discussed. J. Hewitt Judd.

Krause, A. C., and Tauber, F. W. **Creatine and creatinine of the ocular tissues.** *Arch. of Ophth.*, 1939, v. 21, June, pp. 1027-1030.

Creatine and its anhydride, creatinine, are important substances taking part in the metabolism of tissue. It is probable that creatine metabolism may be related to cataract in dystrophia myotonica, to atrophy of the ocular muscles in myasthenia gravis, and to other ocular diseases. Because the knowledge of ocular creatine is so meager, a study of bovine ocular tissues was made. The authors describe

their procedure and report the colorimetric determination of creatinine and total apparent creatinine (creatine plus creatinine). Creatinine of lens, iris, retina, optic nerve, and cornea was isolated as the potassium pictrate.

J. Hewitt Judd.

Miklós, Andor. Cure of a spontaneous orbital hematoma. *Klin. M. f. Augenh.*, 1939, v. 102, May, p. 699.

A woman of 29 years who had been for five days suffering from a dull pain in the right half of the head suddenly felt a cracking in the left orbit and a gradual protrusion of the left eyeball with chemosis, ecchymosis, and swelling of the lids. The veins of the fundus were somewhat enlarged; vision 5/10. The eye was covered with a watch crystal and the patient was given iodine. An ulcer developed in the lower part of the cornea, but the hematoma gradually absorbed and the ulcer healed after ten days in the hospital. The exophthalmos subsided, vision returning to normal. C. Zimmermann.

Mueller, Friedrich. Questions about ocular circulation. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 2, pp. 524-526.

The author discusses at length the work of Havlicek on the physiology of blood circulation. According to Havlicek, the blood vessels may be classified in two groups, private vessels and public vessels. For instance, he calls private vessels those which, on entering the kidney, limit their action to supply blood to the kidney itself for its nutrition. Public vessels would be those which going to the glomeruli have a function of great importance to the rest of the organism, such as the excretion of urine. In regard to the capillary circulation, Havlicek believes that there

is a network of larger vessels which directly connect the arteries with the veins without the intermedium of the capillaries. The function of these intermediate blood vessels, which Havlicek calls precapillaries, would be to shut off the capillary circulation when regulation of the supply of blood in some organ or the secretion of some gland was necessary. This theory applies to the eyes. The author concludes from the study of Havlicek that the retinal vessels would be public ones, while the choroidal vessels and the long and short posterior ciliary arteries would be private ocular blood vessels, which may play an important role in the regulation of normal intraocular pressure. The study of the precapillary circuits of the eye, which are able to regulate the intraocular pressure, may give the answer to the pathogenesis of the different types of glaucoma.

Ramon Castroviejo.

Odintzov, V. P. Metastatic ophthalmia. *Viestnik Ophth.*, 1939, v. 14, pt. 5, p. 3.

A review of the literature and an analysis of 464 reported cases. The author finds that clinically the disease assumes three types: (1) an acute purulent perforating panophthalmitis ending in phthisis bulbi (caused by the streptococcus, and usually seen in puerperal sepsis); (2) a subacute form, sometimes perforating but usually ending in atrophy of the globe without perforation (caused by the pneumococcus and meningococcus); and (3) an indolent form, occasionally ending in recovery, but usually leading to atrophy of the globe (seen with meningococcus infections, but most frequently as a complication of grippe, measles, or typhus). The author believes that the disease is caused not by thrombi from

the original focus, but by minute infective particles circulating in the blood and arrested in the small lumens of the retinal and choroidal capillaries.

Ray K. Daily.

Petrov, A. A. A case of unilateral intermittent exophthalmos. *Viestnik Opht.*, 1939, v. 14, pt. 6, p. 76.

A woman 25 years old had an attack of exophthalmos of the left eye whenever she did any work which required leaning over. After an exhaustive examination, essentially negative, the diagnosis was exophthalmos due to dilated orbital veins caused by an endocrine disturbance of pregnancy.

Ray K. Daily.

Popova, S. A. *Bacillus proteus vulgaris*. *Viestnik Opht.*, 1939, v. 14, pt. 6, p. 72.

A report of panophthalmitis caused by *bacillus proteus vulgaris*, complicating a combined cataract extraction.

Ray K. Daily.

Reber, J., and Scheie, H. G. Bilateral endophthalmitis complicating pneumococcic septicemia. *Arch. of Ophth.*, 1939, v. 21, May, pp. 731-734.

The first manifestation of a generalized septicemia in a man aged 48 years was bilateral endophthalmitis occurring two weeks after a puncture wound of the foot which caused a local infection and lymphangitis of the foot and lower part of the leg. Death ensued after five weeks and at autopsy the patient was found to have multiple infarctions of the spleen and kidneys, bronchopneumonia, endocarditis, and phlebitis of the left femoral vein. Cultures from the blood and from fluid aspirated from the eye were positive for type 16 pneumococcus.

J. Hewitt Judd.

Walker, C. B. Graduated posterior evisceration. *Trans. Sec. on Ophth., Amer. Med. Assoc.*, 1938, 89th mtg., p. 309.

This is a modified evisceration in which a large glass or plastic ball is implanted within the scleral shell. The operation is described in detail.

George H. Stine.

14

EYELIDS AND LACRIMAL APPARATUS

Almeida, A. de. External dacryocystorhinostomy. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 2, pp. 435-439.

The author prefers dacryocystorhinostomy to extirpation of the sac in the treatment of chronic dacryocystitis. He has performed 12 operations following the technique advocated by Dupuy-Dutemps, and 15 using the Toti technique. Of a total of 27 operations, the result was perfect in 14 cases, fair in 3, and without improvement in 4. Six cases could not be followed long enough to report the final result.

Ramon Castroviejo.

Arutinov, V. I. A chancre of the lid border of the upper lid, simulating a sty. *Viestnik Opht.*, 1939, v. 14, pt. 6, p. 67.

A report of a case of hard chancre of the lid in a woman 22 years old.

Ray K. Daily.

Askalanova, T. M., and Zakharova, A. P. The correction of ptosis with buried sutures. *Viestnik Opht.*, 1939, v. 14, pt. 6, p. 64.

Two sutures are introduced in the manner of the Snellen sutures with the knots buried in the frontalis muscle. (Illustration.)

Ray K. Daily.

Bulach, X. Blepharoplasty with a free skin transplant from the auricle. *Viestnik Opht.*, 1939, v. 14, pt. 6, p. 46.

The skin from the posterior surface of the auricle is particularly suitable for repair of cicatricial ectropion, because it is morphologically and biologically related to the face. Thirteen cases of cicatricial ectropion caused by anthrax were operated upon in this manner with excellent results. In two cases of tuberculous ectropion and in one case of defect of the lid caused by a carcinoma, the results were not good because in each instance the thin cutaneous transplant was inadequate to fill the deep defect.

Ray K. Daily.

Diggle, F. H. Intranasal drainage (West's operation) for the relief of lacrimal obstruction. *Practitioner*, 1939, v. 142, June, p. 773.

The author discusses the technique and indications for the intranasal dacryocystorhinostomy of West. He reports a series of 99 cases, 78 of whom have been traced. Of these 74.3 percent were completely successful, 11.5 percent moderate cures, and 16.6 percent complete failures.

T. E. Sanders.

Gifford, S. R. Paradoxical elevation of the lid. *Arch. of Ophth.*, 1939, v. 22, Aug., pp. 252-256.

A child aged ten years presented a picture of complete paralysis of the left third nerve, with complete paralysis of elevation and depression in both eyes. After a Blaskovics operation on the left upper lid, a paradoxical movement was noticed which has not been previously described. When the right eye was opened naturally, the left upper lid drooped completely. During natural winking movements, each time the right lids were closed the left upper lid showed a spastic movement of elevation. The lid was raised 5 to 6 mm., the

movement lasting less than a second, after which complete relaxation of the lid occurred immediately. The movement was evidently made by the levator muscle, since the frontalis muscle did not participate. On natural closure of the eyes, as in sleep, and on forced closure the same rapid elevation of the lid occurred, although it was sometimes slighter than the movement seen in winking. After this rapid movement executed by the levator muscle, the lid was elevated by the frontalis muscle 3 to 4 mm. and remained in this position during forced closure of the right lid. The quick movement was not under voluntary control but occurred automatically with each closure of the right lids. There was no upward movement of either eye on closure of the lids, the left eye remaining turned 15 degrees lower than the right and abducted about 50 degrees. No similar retraction occurred when the child attempted to look up or down. The left pupil was dilated and did not react to light or in accommodation. Other paradoxical movements of elevation are discussed and compared with the one reported. The theory of aberrant regeneration of nerve fibers seems to be the most plausible explanation. (Photographs.)

J. Hewitt Judd.

Guyton, J. S., and McLean, J. M. Isolated rheumatic nodule of the upper eyelid. *Amer. Jour. Ophth.*, 1939, v. 22, Sept., pp. 985-992.

Harner, C. E. Nasolacrimal drainage after combined external and intranasal tear-sac operation. *Amer. Jour. Ophth.*, 1939, v. 22, Aug., p. 907.

Klauber, E. Conjunctival transplantation in the operative treatment of trichiasis. *Ann. d'Ocul.*, 1939, v. 176, June, pp. 476-477.

The author previously used Van Milligan's operation of transplantation of buccal mucous membrane in the treatment of trichiasis. Because of the impossibility of asepsis of the mouth, the patient's discomfort at having the inner surface of the lip denuded, and other technical difficulties, the graft is now satisfactorily taken from the bulbar conjunctiva instead of from the lips.

John M. McLean.

Kravitz, Daniel. Hodgkin's disease of the lid. *Arch. of Ophth.*, 1939, v. 21, May, pp. 844-852.

A small cystic tumor at the superior orbital border near the inner angle, which clinically appeared to be a fibroma, was removed and found to be typical of Hodgkin's disease. The literature is reviewed with special reference to etiology, differential diagnosis, course, treatment, and prognosis. (Photomicrographs.)

J. Hewitt Judd.

Lauber, H. A case of blepharoplasty. *Ophthalmologica*, 1939, v. 97, July, p. 312.

In a 17-year-old boy, a basal-cell carcinoma arose in the upper lid, presumably in consequence of radium treatment of an angioma when he was three years old. Three plastic operations (Filatov's blepharoplasty with round stalk, repeated once, and free skin-graft taken from the upper arm) ended in necrosis of the flap. A flap with double insertion brought down from the forehead was successful. The necroses and the copious bleeding which accompanied each operation were ascribed to the effects of the radium.

F. Herbert Haessler.

Laval, Joseph. Congenital fistula of the lacrimal sac. *Amer. Jour. Ophth.*, 1939, v. 22, Sept., pp. 1022-1023.

Natanson, M. S. Lysozyme in the therapy of blepharitis. *Viestnik Opht.*, 1939, v. 14, pt. 5, p. 22.

Lysozyme was used in 104 cases of various types of blepharitis; its effect was good even in old cases, with complete cures in 19.5 percent of oily, 11.8 percent of squamous, and 9.7 percent of ulcerative blepharitis. Improvement took place in 61 percent of ulcerative, 79 percent of squamous, and 72 percent of oily blepharitis. Ray K. Daily.

Pozzo, Ezio Da. True congenital distichiasis. *Bull. d'Ocul.*, 1938, v. 17, Dec., pp. 1015-1034.

A woman of 27 years had a number of supplementary eyelashes on the posterior lip of the lid margins, forming at their implantation an angle of 90° with the normal cilia. They were grayish-black in color and 2 to 4 mm. long. Her boy of five years, who was affected also by syndactylia, showed the same anomaly. Trachoma was excluded. At the microscope the lashes appeared to have no medullary substance and their follicles were surrounded by sebaceous-like glands (rudimentary meibomian glands). In regard to the etiopathogenetic problem, the writer believes that this is a recessive and regressive malformation. The piliferous meibomian gland is analogous to that seen in some lower animals. Bibliography, 5 figures.)

M. Lombardo.

Reitsch, Treatment of lacrimal affections by tamponade salve. *Klin. M. f. Augenh.*, 1939, v. 102, June, p. 846.

An ointment having a melting point of 39 degrees is converted into liquid form by warming and is then introduced into the lacrimal passages by means of a syringe and allowed to harden. It is left in place from one to

four days, remaining in contact with the inflamed mucous membrane.

C. Zimmermann.

Savin, L. H. A note of three cases showing "crocodile tears" after facial paralysis. *Brit. Jour. Ophth.*, 1939, v. 23, July, pp. 479-482.

The author credits Tumarkin, who reported 13 cases (*Lancet*, 1936, v. 1, p. 26) as advancing the most reasonable explanation for the peculiarity. A diagram of the nerves involved in the production of the "crocodile tears" accompanies the discussion and clarifies the clinical aspects outlined. The author reports cases observed since the publication of Tumarkin's papers. The first two cases discussed refused to undergo partial excision of the lacrimal gland, stating they had become tolerant of their condition; while the third case, with the ganglion blocked by cocaine, experienced no relief even of a temporary nature. The experiment was not deemed convincing in that a concurrent conjunctivitis was also present. (Figure, references.)

D. F. Harbridge.

Stokes, W. H. Transplantation (implantation) of the lacrimal sac in chronic dacryocystitis. *Arch. of Ophth.*, 1939, v. 22, Aug., pp. 193-210; also *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1938, 43rd mtg., p. 342.

After reviewing the various methods of treating chronic dacryocystitis by creation of an artificial passageway into the nose, the author describes his technique of implantation of the lower end of the tear sac into the nose through a trephine opening, 8 to 10 mm. in diameter, in the ascending process of the maxilla. Three silk sutures are placed in the lower end of the sac after it is cut through completely as far down

as possible. The sutures are drawn through the nostril to hold the sac in the bony canal. The results in 42 operations on 39 patients are summarized and presented in a table. Three cases in which failure occurred are reported, illustrating that any coexisting nasal pathology must be corrected as a preliminary step, and that this procedure is not suitable for atrophic sacs. The steps of the operation are shown by drawings. (Discussion.)

J. Hewitt Judd.

Tooke, F. T. A case of aleukemic lymphosis involving the upper lids. *Brit. Jour. Ophth.*, 1939, v. 23, July, pp. 444-454. (See *Amer. Jour. Ophth.*, 1939, v. 22, Sept., p. 1060.)

Von der Heydt, R. Dermatological lesions about the eyes. *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1938, 43rd mtg., p. 25.

The author lists 37 dermatologic lesions of the eyelids with their manifestations in the eye itself.

George H. Stine.

15

TUMORS

Charamis, J. Clinical, anatomic, and microscopic study of six cases of choroidal sarcoma. *Bull. Soc. Hellénique d'Opht.*, 1939, v. 8, Jan.-March, p. 92.

Six cases of choroidal sarcoma are analyzed from the standpoints of ophthalmoscopic picture, localization, consistency, pigmentation, vascularization, and cell type. George A. Filmer.

Ciotola, Guido. A case of flat melanoma of choroid. *Boll. d'Ocul.*, 1938, v. 17, Dec., pp. 991-1003.

A man of 70 years had his right eye enucleated for intraocular growth. Section of the eye showed that the neo-

plasm extended from the iris to the optic nerve, being 2 mm. thick anteriorly, 1 mm. at the equator, and 2 to 3 mm. at the posterior pole, and occupying about three-fifths of the uveal tract. It appeared to be rich in pigment and was composed of round and spindle cells. The author believes that it originated from a formation resembling a nevus of the uvea. (Bibliography, 5 figures.) M. Lombardo.

Grancini, L. E. Meningioma of the orbit. *Rassegna Ital. d'Ottal.*, 1939, v. 8, March-April, pp. 179-196.

Grancini discusses the modern histologic knowledge of tumors of the orbit and in particular, the meningioma. The meningeoblast is a particular cell, neither connective tissue nor epithelium, but as autonomous as the cells of Schwann or the glial cells. Orbital meningiomas are much rarer than similar intracranial growths. The patient described was a woman of 41 years in whom the tumor arose from the upper wall of the left orbit. The exophthalmos measured 10 mm. The tumor was incompletely removed surgically but was later treated intensively with X rays and radium. After four years the patient was clinically cured. (5 figures.)

Eugene M. Blake.

Martin, H. E. Cancer of the eyelids. *Arch. of Ophth.*, 1939, v. 22, July, pp. 1-20.

This paper is based on the study of 147 cases of cancer of the eyelid treated at the Memorial Hospital between 1925 and 1935. The author discusses the etiology, symptoms, clinical course, diagnosis, incidence of types, and the selection and technique of treatment. While cancer of the eyelid is not a highly fatal disease, the growth or its treatment may result in impairment of

vision or a cosmetic defect. Although many smaller lesions may be treated by either irradiation or surgical excision, with acceptable end results, moderately sized growths are more satisfactorily treated by irradiation. Extensive tumors often require radical surgical excision or a combination of irradiation and surgical excision. The article is illustrated by photographs showing tumors of various types and locations before and after treatment by various methods. J. Hewitt Judd.

Meyer, F. W. Recklinghausen's neurofibromatosis and the eye. *Klin. M. f. Augenh.*, 1939, v. 103, July, p. 44.

A farm laborer of 29 years showing mental debility and endocrine disturbances, stated that his right upper lid had been growing larger for several years. It was unusually thickened and hung down over the lower lid like an apron. The diagnosis of neurofibroma with elephantiasis was confirmed by histologic examination of skin nodules on the left shoulder. The lid tumor was later extirpated. C. Zimmermann.

Pincus, Ludwig. Neoplasms of the iris. *Ophthalmologica*, 1939, v. 97, July, p. 302.

The author describes four neoplasms of the iris: (1) A spindle-cell sarcoma in a boy of sixteen years which was removed in 1934 by iridectomy. It recurred in 1936 and after a second iridectomy the eye remained well. (2) A ring sarcoma of the iris that developed primarily as a ring sarcoma. (3) A tumor which originated from the cells of the secondary optic vesicle, probably a genuine glioma, in a man thirty years of age. (4) An endothelial neoplasm which presumably arose by proliferation of persistent embryonic cells in the chamber angle. F. Herbert Haessler.

Rand, C. W., Irvine, R., and Reeves, D. L. Primary glioma of the optic nerve. *Arch. of Ophth.*, 1939, v. 21, May, pp. 799-816.

A four-year-old boy had presented a slowly progressing unilateral exophthalmos for one year. At intracranial exploration the nerve was found to be symmetrically enlarged starting about 1.5 cm. from the chiasm and extending forward to the globe. The tumor proved to be a polar spongioblastoma. One month later the eye with the remaining portion of the nerve was enucleated, and recovery was uneventful. The authors point out the unjustifiable hazard involved with an incomplete orbital removal since intracranial extension of the tumor occurs in a high proportion of cases. Technically, complete extirpation is more certain and meningitis less likely to occur if done through the intracranial approach. The diagnostic signs are atrophy of the optic nerve or optic neuritis, slowly progressive non-pulsatile exophthalmos, and roentgenographic evidence of enlargement of the optic foramen. J. Hewitt Judd.

Schreck, Eugen. Clinical and pathologic anatomy of orbital tumors. *Klin. M. f. Augenh.*, 1939, v. 103, July, p. 1.

Schreck investigated 259 clinical histories in the eye clinic at Heidelberg from 1900 to 1937 as to whether clinical diagnosis of orbital tumor could be verified by subsequent pathologic examination. Frequency and definite clinical symptoms of the different kinds of tumor were recorded. A total of 190 patients had been operated upon and the specimens systematically classified according to pathologic findings.

C. Zimmermann.

Sharp, G. S. The treatment of cancer of the eyelids. *Trans. Sec. on Ophth.*,

Amer. Med. Assoc., 1938, 89th mtg., p. 77.

From 1932 to 1937 inclusive 62 consecutive patients with cancer of the eyelids were treated by surface and interstitial irradiation, the technique of which is described. It is the author's opinion that the prognosis for cancer of the eyelids is excellent when irradiation is used. Six cases are described in detail and illustrated. (Discussion.)

George H. Stine.

Trantas, A. Melanoma of the choroid. *Bull. Soc. Hellénique d'Opht.*, 1939, v. 8, Jan.-March, p. 43.

The author recommends the use of the diaphanoscope in searching for melanomas of the choroid. With this method he has discovered ten times as many tumors as he had found with the ophthalmoscope. George A. Filmer.

Wilder, H. C., and Callender, G. R. Malignant melanoma of the choroid. Further studies on prognosis by histologic type and fiber content. *Amer. Jour. Ophth.*, 1939, v. 22, Aug., pp. 851-855.

16

INJURIES

Gorovaja, G. X., and Rapoport, M. X. Chalcosis of the eyeball. *Viestnik Opht.*, 1939, v. 14, pt. 5, p. 47.

A review of the literature and report of three cases; two following injuries with penetration of a copper particle into the eyeball, and one following a year's use of a copper ointment for trachoma.

Ray K. Daily.

Juraszynska, Janina. The value of biomicroscopy of ocular injuries. *Klinika Oczna*, 1939, v. 17, pt. 3, p. 346.

A description of the biomicroscopic pictures of a number of ocular injuries.

and a plea for more extensive use of biomicroscopy. (Illustrations.)

Ray K. Daily.

Mitskevich, L. D. **Three cases of perforating ocular injuries with invasion of the iris by multiple foreign bodies.** *Viestnik Opht.*, 1939, v. 14, pt. 6, p. 77.

A report of three cases of ocular injuries caused by accidents in blasting, with invasion of the conjunctiva, sclera, cornea, and iris by numerous particles of carbon, stone, quartz, and similar substances. The conclusions are that minute particles of such foreign bodies are tolerated well by the cornea and iris, provided no infection sets in. Open treatment of burns and wounds of the adjacent skin serves to prevent secondary infection of the ocular injuries, while treatment with ointments and bandages is conducive to infection.

Ray K. Daily.

Nergler, Stefania. **Intraocular foreign bodies.** *Klinika Oczna*, 1939, v. 17, pt. 3, p. 437.

An analysis of 130 intraocular foreign-body cases treated at the Ophthalmic Institute of Warsaw during the five years, 1933 to 1938. In general the data indicate that the prognosis becomes poorer in proportion to the depth to which the foreign body penetrates the eyeball and to the delay in its extraction.

Ray K. Daily.

Smelanski, P. I. **Traumatism of the optic nerves.** *Viestnik Opht.*, 1939, v. 14, pt. 6, p. 49.

A report of a case of evulsion of the optic nerve from the globe, caused by an injury from a knife penetrating through the upper inner angle of the orbit.

Ray K. Daily.

Stroobants, C., and Schepens, C. **Acetylarsan and accidents related to the**

visual apparatus. *Ann. d'Ocul.*, 1939, v. 176, July, pp. 519-537.

Arsenical derivatives used in medicine are divided into two groups: (1) those which are only weak spirillicides and which have general toxic properties (inorganic arsenicals and the acyclic organic arsenicals), and (2) those which are strong spirillicides (cyclic organic compounds). Ocular accidents practically never occur from arsenicals in the first group. Chemistry of the second group is discussed. The most toxic compounds are atoxyl and arsa-cetine. Many cases of serious optic neuritis have resulted from these drugs. Other derivatives such as stovarsol, tryparsamide, and acetylarsan are much less dangerous, but still can cause blindness. Acetylarsan can cause a variety of toxic manifestations. One case is reported with bilateral optic neuritis. Symptoms of involvement do not often appear after two or three injections of acetylarsan; sometimes, however, they are observed after the tenth or even the twentieth injection. They consist of photopsia, repeated loss of visual field, and reduction of visual acuity. The visual field usually takes an oval form with the long axis horizontal. The author raises the question whether these signs and symptoms are really drug intoxication or the result of syphilis, occurring in the ordinary course of the disease or as a neurorecidive. The fact that several cases have been reported where this drug was used in diseases other than syphilis, the fact that most cases of intoxication follow excessive dosages, and the fact that the lesion seems to take a typical course, getting worse and not better, and that there is no related inflammatory lesion, all point toward drug intoxication. In order to avoid these unfortunate effects careful physical examination with emphasis on

the circulatory system, liver, nervous system, urinalysis, and blood-urea determination is recommended during treatment with such a drug. When the optic nerve does become involved the drug must be stopped at once and sodium hyposulphite administered both intravenously and by mouth for at least a month. If the retinal vessels are contracted vasodilators are also advised. In spite of the danger of ocular intoxication, treatment of ocular lesions with this drug is recommended if the general physical examination seems favorable and if the eye lesions are definitely due to syphilis.

John M. McLean.

Winkler, A. Carbolic-acid burn of both eyes and general sequelæ, with remarks on the therapy of chemical burns of the eye. *Klin. M. f. Augenh.*, 1939, v. 102, June, p. 810.

A mixture of 50 percent phenol, 25 percent cresol and 10 percent xylol squirted under pressure into the face of a laborer, causing third-degree burns of both eyes and the face. Toxic action of the absorbed phenol damaged the kidneys and hematopoietic apparatus, producing a severe anemia. The therapy has been conservative in 215 similar cases seen within the last five years at the eye clinic of Halle.

C. Zimmermann.

17

SYSTEMIC DISEASES AND PARASITES

Falcao, Theophilo. Ophthalmic zona and its treatment by neosalvarsan and ultraviolet rays. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 2, pp. 447-449.

A ten-year-old patient with ophthalmic zona was successfully treated with ultraviolet rays and injections of neosalvarsan. Similar cases treated with

neosalvarsan and reported in the literature are mentioned.

Ramon Castroviejo.

Moore, T. I. Arachnodactyly. *Arch. of Ophth.*, 1939, v. 21, May, pp. 854-855.

The case reported is that of a boy aged six years who presented the typical findings including congenital heart disease. No others in the family were affected. (Photographs.)

J. Hewitt Judd.

O'Brien, C. S., and Allen, J. H. Ophthalmomyiasis interna anterior. *Amer. Jour. Ophth.*, 1939, v. 22, Sept., pp. 996-998.

Przybylski, Z., and Madroskiwicz, M. The value of Löwenstein's method in the diagnosis of ocular tuberculosis. *Klinika Oczna*, 1939, v. 17, pt. 3, p. 377.

A review of the literature relative to Löwenstein's method of culturing tubercle bacilli from the blood of tuberculous patients, and a tabulated report of 37 blood cultures (31 from patients with ocular diseases and 6 from known tuberculous patients), all negative.

Ray K. Daily.

Reitsch, W. Ciliary neuralgia. *Klin. M. f. Augenh.*, 1939, v. 102, May, p. 706.

After an intense nasal catarrh, the author noted a painful spot near his right nasal bone at the border of the lateral cartilage, probably an ulcer. Simultaneously a right-sided ciliary pressure pain occurred on closure and lateral movements of the eyes. The ciliary pain was relieved by diminishing the nasal pain (larocaine sponges), and disappeared with healing of the nasal affection. As the nasal mucous membrane is supplied by the anterior ethmoidal nerve (a branch of the ophthalmic nerve), the reflex action from

the nose on the ciliary nerve is explained. In ciliary pain of obscure origin search should be made for sensitive places in the nose and, even if not found, anesthesia of the nasal mucous membrane may be tried for relief.

C. Zimmermann.

Viallefont, Harant, and Temple. Ocular euliasis. *Ann. d'Ocul.*, 1939, v. 176, June, pp. 417-435.

The authors have used the term "euliasis," derived from the Greek word for larva, to designate parasitic involvement of the eyes. An extensive review of the literature is given and two cases (adults) are briefly reported. In one a small irritative subconjunctival foreign body removed under local anesthesia at the slitlamp proved to be a primary larva of "Oestrus ovis." In the second case six small white larvæ under the conjunctiva were similarly removed. In both cases removal was followed by full relief of symptoms.

John M. McLean.

Wile, U. J. Constitutional background, differential diagnosis, and treatment of dermatological lesions about the eyes, ears, nose, and throat. *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1938, 43rd mtg., p. 43.

This address discusses a variety of conditions and does not lend itself to abstracting.

18

HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Alvaro, M. E. Importance of social service in the practice of ophthalmology. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 2, pp. 493-497.

The author discusses at length his recent tour of the United States, during which he had the opportunity of ob-

serving how the social service operated in connection with ophthalmic clinics.

Ramon Castroviejo.

Andrade, C. de, and Ferreira, L. The greatest factors of blindness in Bahia. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 2, pp. 505-509.

Statistics of causes of blindness in the state of Bahia during the past twenty years.

Ramon Castroviejo.

Bardelli, Lorenzo. The new Clinica Oculistica of Florence. *Boll. d'Ocul.*, 1936, v. 17, Dec., pp. 961-977.

A detailed description is given of the new institute, which includes 133 beds thirty of which are located in the isolation pavilion.

M. Lombardo.

Beach, S. J. Problems in special study for general physicians. *Jour. Amer. Med. Assoc.*, 1939, v. 113, Aug. 26, p. 731.

The influence of the American Board of Ophthalmology has led to great improvement in the training of ophthalmologists. The opportunities for physicians without formal training are, however, totally inadequate. Four expedients are discussed. George H. Stine.

Berens, Conrad. Standards for outpatient service in ophthalmology. *Amer. Jour. Ophth.*, 1939, v. 22, Aug., pp. 870-875.

Cantamessa, Gustavo. The eye and painting. *Boll. d'Ocul.*, 1938, v. 17, Dec., pp. 1035-1040.

Form and colors are the objects of vision, and form and colors constitute the representation of a picture. This relationship is affected in individuals with uncorrected or uncorrectable ametropias, with dyschromatopsias, and in monocular vision. The influence that

these conditions may have is discussed in detail by the writer. Artists with myopia or hyperopia give to their works synthetic and poorly defined outlines, according to analogous alterations in their retinal images. The astigmatic have an imperfect vision in the horizontal, vertical, or oblique lines which has its influence on the picture or design. The artist with monocular vision gives less relief to objects and figures because of his lack of stereoscopic sense. Color tone of the retinal images depends on the quantity of light entering the eye through the sclera, being colder if the light penetrates in greater quantity. This penetration is greater in blonds, who tend to give to their pictures a cold tone, and less in brunettes, who prefer a warm tone.

M. Lombardo.

Esser, A. A. M. Etiology of blindness in antiquity. *Klin. M. f. Augenh.*, 1939, v. 103, July, p. 100.

Esser speaks of the chemical and physical causes of blindness found in ancient literature and mentions Xenophon as the first to report snow blindness.

C. Zimmermann.

Figueira de Mello, Francisco. Illumination in public, private, and high schools in the capital of São Paulo. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 2, pp. 489-491.

The author reports the results of his study of light conditions in the private and public schools of São Paulo.

Ramon Castroviejo.

Gomes, P., and Alvaro, M. E. Causes of blindness at the Padre Chico Institute. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 2, pp. 470-487.

The authors estimate that there are

about 40,000 blind people in the U. S. of Brazil. In the absence of complete statistics on the causes of blindness, they studied 87 cases at the Padre Chico Institute. It was found that 31 had lost the visual function on account of corneal lesions and 27 because of lesions of the globe as a whole. Thirteen cases presented opacification of the lens accompanied by lesions of the fundus. Postmeningitic optic atrophies were observed in 6 cases, and optic atrophies following lesions of the retina in 6 more; 4 cases showed primary optic atrophy. There was one case of disseminated chorioretinitis and another of pupillary occlusion. Etiologic factors of the different lesions are quoted as follows: ophthalmia neonatorum 35 cases, trachoma 10, syphilis 10, different exanthemata 4. Two cases were due to severe burns, one of them from radium. Two cases were due to failure of decompressive operations in the treatment of buphthalmos. Of the 24 other cases, the etiology was difficult to determine. Ramon Castroviejo.

Gordon, B. L. Oculists and occultists; demonology and the eye. *Arch. of Ophth.*, 1939, v. 22, July, pp. 25-65.

The psychologic principle on which the therapeutic effect of suggestion depends is based on the faith that each person has in the healer, whether the method employed is that of mumbling magic formulas or that of suggestion as used by psychiatrists. The author traces the development of demonology in its relation to medicine from the periods of ancient Egypt, Assyria, Greece, and Rome to medieval Christianity and down to modern mesmerism, hypnotism, Christian Science, spiritualism, and Couéism. Many present-day beliefs and superstitions can be traced back to the demonic beliefs found in the Old

Testament and in the middle ages. The author lists the names of pathogenic demons and the patron saints of diseases, and discusses the supposed habits and modes of transmission of demons, the use of protective amulets, exorcism, and physical remedies to expel demons.

J. Hewitt Judd.

Higgins, S. G. Ophthalmic surgery at missions in India. *Amer. Jour. Ophth.*, 1939, v. 22, Aug., pp. 876-881.

Jensen, A. F., and Gradle, H. S. The need for social-service work in glaucoma. *Amer. Jour. Ophth.*, 1939, v. 22, Sept., pp. 993-995.

Korb, J. H. Perception time and nightblindness. *United States Naval Med. Bull.*, 1939, v. 37, July, p. 392.

Using the biophotometer, 630 individuals in different branches of the naval service were tested for nightblindness. Those classified below normal included 5.17 percent of naval aviators, no naval-aviation pilots, 19.26 percent of chief petty officers, and 19.45 percent below the rank of chief petty officer.

George A. Filmer.

Lewis, Park. The responsibility of the medical profession in the prevention of blindness. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 2, pp. 511-514.

The author reviews the work done in the United States for the prevention of blindness, especially in cases of ophthalmia neonatorum and syphilis.

Ramon Castroviejo.

Lijo, Pavia. International Association for the Prevention of Blindness. The work of the National Argentine Committee. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 2, pp. 471-474.

This committee has carried out through subcommittees in charge of each province a campaign to create schools for amblyopic children. All children attending school were thoroughly examined for ocular disease and refracted.

Ramon Castroviejo.

Motais, F. Can a change of residence or living conditions attenuate the virulence of endemic trachoma? *Rev. Internat. du Trachome*, 1939, v. 16, April, p. 88.

In Cambodia and Northern Cochinchina the author found that, although from 50 to 80 percent of the native coolies were affected with trachoma, the percentage of invalidity from the disease was very low.

J. Wesley McKinney.

Pereira, Dulcidio. Modern illumination as a factor of visual hygiene. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 2, pp. 453-467.

A lengthy discussion on the subject of illumination as a problem of ocular hygiene.

Ramon Castroviejo.

Pimentel, P. C. Sight-conservation classes. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 2, pp. 499-503.

The author discusses at length the work done in the United States and Germany in sight-conservation classes.

Ramon Castroviejo.

Rotter-Musialowa, J. The problem of blindness from the standpoint of therapy. *Klinika Oczna*, 1939, v. 17, pt. 3, p. 443.

A description of the work of all agencies (medical, educational, and financial) engaged in assisting the blind. The author points out the inadequacy of existing agencies, and the shortage

and poor distribution of ophthalmologists.
Ray K. Daily.

Snell, A. C. Visual acuity; its relation to the form sense and the application of this relationship to medicolegal problems. *Trans. Sec. on Ophth, Amer. Med. Assoc.*, 1938, 89th mtg., p. 38.

A method for computing the functional and proportionate values for acuity notations has been established, and by this method each increase in the visual angle reduces visual resolving power (efficiency) by the same percentage. In the application of this method to the medicolegal problem of evaluating disabilities for identical degrees of damage to function, identical percentage losses are established. (One table, discussion.) George H. Stine.

Spinola, Colombo. Prevention of blindness, organization in Bahia. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 2, pp. 481-487.

After reporting measures for prevention of blindness carried out in different American and European countries, the author mentions the work of the Santa Lucia Foundation located in the state of Bahia, Brazil.

Ramon Castroviejo.

Spiratos, Spyridon. The infectious eye diseases in Greece (Athens). *Klin. M. f. Augenh.*, 1939, v. 102, June, p. 806.

Since 1932 the laboratories of the university ophthalmic and gynecologic clinics have studied the general consequences of various infectious eye diseases, and the normal and pathologic bacterial flora. From 1928 to 1934 103,657 patients were treated at the eye clinic. The conditions included trachoma (8.91 percent) and acute conjunctivitis (8.78 percent). Of 714 cases of acute conjunctivitis, pneumococci

were found in 77 (10.7 percent), diplobacilli of Morax-Axenfeld in 41 (5.7 percent), streptococci in 21 (2.5 percent), Koch-Weeks bacilli in 358, and no micro-organisms in 86 (12.0 percent). The incidence of Koch-Weeks bacillus was highest in October and November, lowest in February and March. The occurrence with xerosis bacillus was frequently observed. Mixed infection with pneumococci is dreaded on account of epithelial desquamation and serpent ulcer.

C. Zimmermann.

Tiscornia, A., and Vila Ortiz, J. M. Trachomatous patients and the industrial accident law. *Ann. d'Ocul.*, 1939, v. 176, June, pp. 451-466.

After detailed discussion of the legal aspects of trachoma in industrial ocular accidents, the author proposes certain general rules to be followed in the examination and management of such cases, and also in medicolegal decisions concerning them. John M. McLean.

Thacker, E. A. A study of ocular defects among university students. *Amer. Jour. Ophth.*, 1939, v. 22, Sept., pp. 1003-1011.

Tupinamba, Jacques. Statistic studies of external ocular affections in school groups in São Paulo. *Trabalhos do Primeiro Cong. Brasileiro de Ophth.*, 1936, v. 2, pp. 475-479.

Statistics furnished by the Department of Public Health of different ocular conditions observed in school children in São Paulo. Ramon Castroviejo.

19

ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

Abashidse, S. The development of secondary vitreous. *Viestnik Ophth.*, 1939, v. 14, pt. 6, p. 53.

Histologic studies of embryos of various ages lead the author to conclude that the primary and secondary vitreous are formed by the lens, retina, and blood vessels. The lens contributes fibers to the secondary vitreous until the development of the hyaloid membrane forms a barrier between the two structures, which occurs, according to Mann, in the 13-mm. or 5-week embryo. In the author's specimen this did not take place until the end of the second month (39-mm. embryo). The contribution of the mesoderm to the secondary vitreous ceases with the obliteration of the vasa hyaloidea propria.

Ray K. Daily.

Crozier, W. J., and Wolf, E. The flicker-response contour for the gecko (rod retina). *Jour. Gen. Physiology*, 1939, v. 22, May 20, p. 555.

The flicker-response contour for the gecko, a nocturnal animal which has a retina with only rods, agrees in all essential respects with that for the turtle which has a cone retina. This shows that assumptions from comparative histologic evidence concerning the properties of rods and cones in relation to visual performance may be quite misleading.

T. E. Sanders.

Crozier, W. J., and Wolf, E. Temperature and critical illumination for reaction to flickering light. 4. Anax nymphs. *Jour. Gen. Physiology*, 1939, v. 22, July 20, p. 795.

Testing nymphs of the dragon fly Anax, it was found that the critical illumination for response to visual flicker falls continuously as the temperature rises, flash frequency and light-time fraction in the flash cycle being kept constant.

George A. Filmer.

Lyle, D. J. Arrests in embryologic development as factors in vision; brief review of the embryology of the eye with associated anomalies of arrested development. *Arch. of Ophth.*, 1939, v. 21, June, pp. 1037-1054.

Some of the more common conditions found in the eye as a result of arrested development of the ectodermal and mesodermal structures are presented and discussed. The various influences causing the disturbances and the mechanism by which the aberrations occur are considered. (Photographs.)

J. Hewitt Judd.

Wald, George. The porphyropsin visual system. *Jour. Gen. Physiology*, 1939, v. 22, July 20, p. 775.

Instead of rhodopsin, a purple pigment porphyropsin is found in the rods of fresh-water fish. This pigment is photolabile and participates in a retinal cycle identical in form with that of rhodopsin. Chemically, porphyropsin differs from rhodopsin in an added ethylene group in the polyene chain.

George A. Filmer.

NEWS ITEMS

Edited by DR. H. ROMMEL HILDRETH

640 S. Kingshighway, Saint Louis, Missouri

News items should reach the Editor by the twelfth of the month

DEATHS

Dr. Josiah Shaftesbury Davies, Tacoma, Washington, died July 11, 1939, aged 60 years.

Dr. James Alfred Watson, Minneapolis, Minnesota, died June 17, 1939, aged 71 years.

Dr. John Alexander Donovan, Butte, Montana, died July 21, 1939, aged 67 years.

Dr. Vincent Joseph Irwin, Springfield, Massachusetts, died June 19, 1939, aged 81 years.

MISCELLANEOUS

The ninth annual Midwinter Clinical Course in Ophthalmology and Otolaryngology at Los Angeles will be given by the Research Study Club January 15 to 26, 1940. The teaching staff will include: Dr. George L. Tobey, Jr., of Boston, Massachusetts; Dr. William J. McNally, of Montreal, Quebec, Canada; Dr. Albert D. Ruedemann, of Cleveland, Ohio; Dr. Algernon B. Reese, of New York City; Dr. Meyer Wiener, of Saint Louis, Missouri; Dr. Edward Jackson, of Denver, Colorado; Dr. John F. Barnhill, of Indianapolis and Miami Beach, Florida; Dr. Simon Jesberg, of Los Angeles, California; Vern O. Knudson, Ph.D., of Los Angeles, California; Dr. Augustus G. Pohlman, of Los Angeles, California; Dr. Louis K. Guggenheim, of Los Angeles, California, and Norman A. Watson, Ph.D., of Los Angeles, California.

The Manhattan Eye, Ear, and Throat Hospital Department of Ophthalmology graduate instruction to the resident staff schedule of evening lectures announces the following lecturers for 1939-1940: Drs. P. Montalvan, M. A. Last, C. Dunn, Joseph Laval, A. A. Eggston, R. T. Paton, R. E. Buckley and H. B. Field. Lectures begin at 7 p.m. Hospital residents and graduate students are invited to attend.

SOCIETIES

The Kansas City Society of Ophthalmology and Otolaryngology announces the following officers for 1939-1940: President, Dr. Arthur N. Altringer; 1st vice-president, Dr. Alvin J. Baer; 2d vice-president, Dr. Wilson K. Hobart; secretary, Dr. Desmond Curran; treasurer, Dr. John McLeod.

The Ophthalmological Society of Australia met at Melbourne, April 19. Illness of the president, Sir James Barrett, prevented his attendance, and the vice-president, Dr. James Flynn, read his president's address on "Blindness and the history of Braille type." Miss Ida Mann brought greetings from the Ophthalmological Society of the United Kingdom and the Section of the British Medical Association, and gave two lectures on "Developmental abnormalities of the eye." She was elected the first honorary member of the Society. Birth injuries to the eye, progressive exophthalmos, orbital tumors, and bullous keratitis were discussed. A visit was made to the Royal Victoria Institute for the Blind.

PERSONALS

Dr. Peter Kronfeld has recently resigned from the faculty of the Union Medical College of Peiping, China, to accept a full-time position as dean of instruction at the Illinois Eye and Ear Infirmary, Chicago. Dr. Kronfeld will have full charge of all graduate and postgraduate work at the Infirmary and will limit his outside activity to ophthalmologic consultation.

Dr. Raymond J. Gray has recently changed his address from 212 Bigham Street, Pittsburgh, Pennsylvania, to 5103 Jenkins Arcade, Pittsburgh. Practice is limited to ophthalmology.

PROPHYLACTIC AND THERAPEUTIC EFFECT OF BACTERIOPHAGE
AND OF ANTIVIRUS IN EXPERIMENTAL STAPHYLOCOCCUS
INFECTION OF THE EYE*

J. BRONFENBRENNER, PH.D. AND S. EDWARD SULKIN, PH.D.

Saint Louis

Having failed to detect any therapeutic effect of the bacteriophage in the treatment of staphylococcus skin infection in experimentally infected animals,¹ we tried to find some other method of producing a local infection which would permit accurate observation of the lesion. The somewhat related experiments of Carrere² appeared to offer such an opportunity. This author investigated the prophylactic value of vaccination with Besredka's antiviral in experimental eye infections of rabbits and guinea pigs, and found it possible to protect the cornea or the anterior chamber of experimental animals by instillation of specific antiviral into the conjunctival sac, or by injection into the anterior chamber, respectively, 24 to 48 hours prior to the injection of the infecting organism. This protection was specific and limited to the treated eye. While such a procedure *a priori* appears inadequate because it is questionable whether the therapeutic agent reaches the actual site of infection by simple instillation into the conjunctival sac, we nevertheless decided to use this technique for the evaluation of both the prophylactic and therapeutic effect of bacteriophage, and incidentally repeat the experiments of Carrere with respect to

the efficacy of the antiviral in this connection.

METHOD OF PRODUCING THE LESIONS

Albino rabbits and guinea pigs were used because of the ease with which changes in opacity of the cornea and hyperemia of the iris could be detected. Injections of bacteria were made as follows: The animal was locally anesthetized by dropping 10-percent cocaine into the conjunctival sac. After two or three minutes approximately 0.1 c.c. of anterior-chamber fluid was removed by inserting a 27-gauge hypodermic needle (with tuberculin syringe attached) into the anterior chamber. The syringe was exchanged for one containing bacterial suspension, leaving the needle *in situ*. The bacteria were injected through the same needle. In order to evaluate the effect of the trauma incident to this procedure, control rabbits and guinea pigs were given anterior-chamber and intracorneal injections of physiological salt solution, using exactly the same technique.

APPEARANCE OF THE LESIONS

In the control animals receiving intracorneal injection of saline, the inoculation was followed by a very slight reaction. After 24 hours there was only a faint clouding at the site of the inocula-

* From the Department of Bacteriology and Immunology, Washington University School of Medicine.

tion with slight injection of the ocular conjunctiva just above the sclerocorneal junction. This traumatic reaction sometimes persisted for four or five days, but generally disappeared after 48 hours.

The control anterior-chamber injections of saline were followed by a slightly more pronounced reaction. After 24 hours there was a slight clouding about the site of inoculation and only an insignificant injection of the vessels of the scleral conjunctiva just above the punctured quadrant of the cornea. A delicate network of vessels appeared to descend into the cornea from the conjunctival vessel nearest the area injected. These vessels, visible under magnification, persisted for a few days, after which they were not detectable even by careful examination with a hand slitlamp (fig. 1).

The usual reactions following the injection of the staphylococci may be briefly described as follows: On the day following the inoculation of bacteria there was a moderate injection of the vessels of the scleral conjunctiva above the injected area particularly along the superior rectus muscles. The degree of injection gradually increased in intensity and at times was so marked that the changes observed earlier in the sclera were almost completely obliterated due to the intense hyperemia. The iris appeared hyperemic and about four or five days after the injection of the bacteria seemed to be thrown into folds (syn-echiae, fig. 2). In the more severe reactions there was a distinct congestion of the palpebral conjunctiva with varying degrees of swelling and edema of the lids (fig. 3). In the eyes showing a marked reaction there frequently developed a mucopurulent inflammatory exudate in the conjunctival sac which was occasionally so abundant that it glued the lids together. Cloudiness of the cornea occurred simultaneously with the injection

of the conjunctival vessels. In several cases this clouding was intensified by the reaction in the anterior chamber so as to give the picture of hypopyon. Definite encroachment of the conjunctival vessels on the cornea became evident 24 to 48 hours after the injection of the bacteria. The vascularity first appeared as a delicate network of vessels just over the limbus. As the encroachment progressed the vessels formed delicate anastomosing loops, and as the reaction further increased in intensity the vessels descended further over the cornea and appeared as a curtain of brushlike processes extending over the entire circumference of the cornea. In exceptional cases the eye became the site of a marked inflammation leading to a panophthalmitis suggestive of keratitis profunda and atrophy (fig. 4). In most cases, however, the injected eyes returned to a normal appearance in the course of several weeks. The corneal reaction began to recede about two or three weeks after the injection of the bacteria. The blood vessels on the cornea, in some instances, remained grossly visible for several weeks or months. In the case of the intracorneal injections, the vessels persisted as a fine network of capillaries surrounding the injected area—so-called salmon patch. The gradual diminution in the conjunctival congestion was usually followed by a decrease in the opacity of the cornea until only a slight clouding or scar could be seen by examination with the hand slitlamp.

EXPERIMENTAL

Although we were primarily interested in the therapeutic effect of bacteriophage, we decided in the preliminary experiment to follow as closely as possible the procedure used by Carrere, who employed the antiviral prophylactically by instillation into the conjunctival sac of animals,

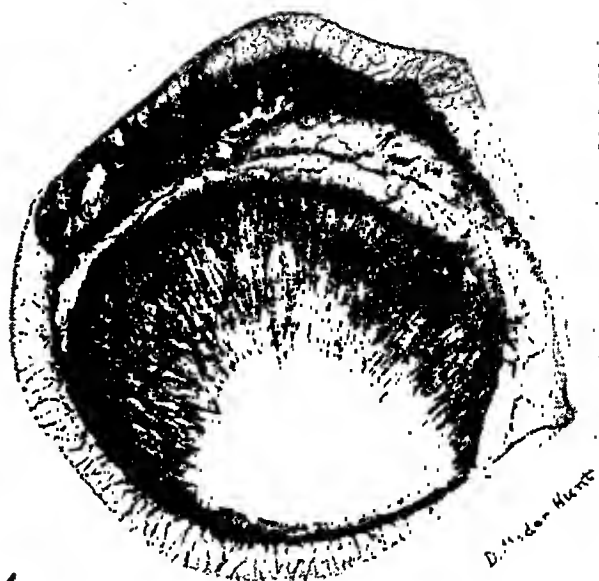
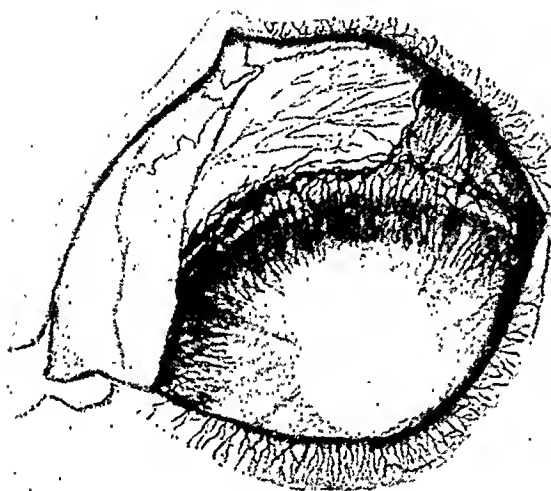
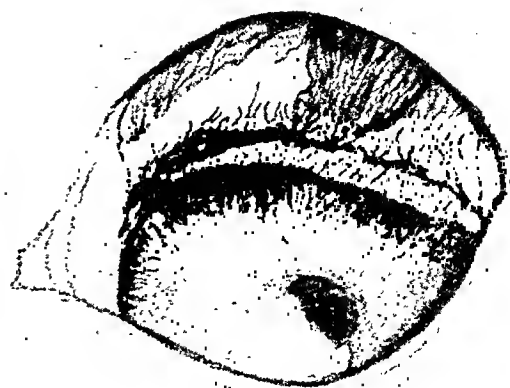
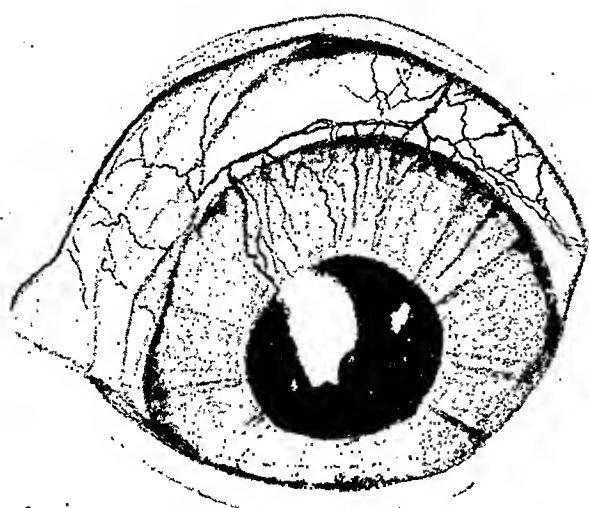


Fig. 1 (Bronfenbrenner and Sulkin). Network of vessels disappearing after a few days, a 1+ reaction.

Fig. 2 (Bronfenbrenner and Sulkin). Hyperemia and synechia, a 2+ reaction.

Fig. 3 (Bronfenbrenner and Sulkin). Congestion of palpebral conjunctiva and edema of the lids, a 3+ reaction.

Fig. 4 (Bronfenbrenner and Sulkin). Panophthalmitis suggesting keratitis profunda, a 4+ reaction.

24 to 48 hours prior to the introduction of bacteria. Throughout all these experiments the agent under investigation (bacteriophage or antiviral*) was instilled into the right eye of the animal, while the left eye in each case received instilla-

tion of sterile broth as control. In the first experiment two guinea pigs each received two drops of staphylococcus bacteriophage into the conjunctival sac of the right eye, while the left eye of each received two drops of sterile broth. Similarly, two other guinea pigs received instillations of staphylococcus antiviral and broth into the right and left eyes, respectively. These instillations were repeated

*The antiviral was prepared according to the method described by Besredka, A. Local immunization. Baltimore, Williams and Wilkins Company, 1927.

every hour for four hours on the first day and again on the second day (eight instillations in all), and on the third day 0.1 c.c. of a suspension of a moderately invasive staphylococcus (from an 18-hour-old agar culture so diluted in physiologic salt solution as to contain 5,000,000 organisms per cubic centimeter) was introduced intracorneally into each eye of all four guinea pigs. As an additional control, one guinea pig received a similar intracorneal inoculation of bacteria in both eyes without having had any preliminary instillation, and another guinea pig received only an intracorneal injection of salt solution in order to indicate the effect of the trauma. The eyes of the animals were observed daily over the period of seven weeks and the record of these observations was made in terms of the arbitrary scale as described earlier.

In no case was the infection prevented by the previous instillations of antiviral or bacteriophage (contrary to expectation on the basis of the findings of Carrere), nor was there observed any difference in the duration of the reaction beyond that which could be ascribed to individual differences of animals. For example, in one of the two animals which received preliminary instillations of antiviral in the right eye, and of sterile broth in the left eye, the infection of both eyes was so severe that it resulted in loss of both eyes in 36 days after the injection of bacteria, while the eyes of the other similarly treated guinea pig returned to normal after about 40 days, as determined by careful examination with the hand slitlamp. Both eyes of the control animal receiving bacterial injection alone returned to normal after about 48 days.

A similar experiment was carried out in rabbits. In this group of animals, however, following the preliminary instillations into the conjunctival sac of antiviral or bacteriophage, the bacteria

were injected into the anterior chamber (instead of intracorneally as before). As in the preceding experiment a variation in the intensity of the reactions, due to the individual peculiarity of the animals, was also noted. The results were essentially the same as those obtained with the guinea pigs in showing that preliminary instillations of antiviral or bacteriophage into the conjunctival sac did not protect the cornea or the anterior chamber of the eye against a severe injection.

In the next series of experiments we attempted to determine the therapeutic effect of bacteriophage and antiviral. In these experiments five guinea pigs and five rabbits were given an intracorneal injection into each eye of a suspension of staphylococcus prepared exactly as described before. Twenty-four hours later the right eye of each animal was subjected to copious washing (by slow instillation into the conjunctival sac of 5.0 c.c. of the therapeutic agent) with either bacteriophage or antiviral. The left eye of each of these animals was similarly washed with plain sterile broth. This procedure was repeated twice daily for a period of 7 days and once daily for 15 days thereafter. During the first three weeks of observation the condition of the eyes was recorded prior to each application of the therapeutic instillation. The severity of the reactions was recorded daily during and after cessation of treatment for a total period of 66 days. Neither the antiviral nor the bacteriophage seemed to have any favorable effect on the course or duration of the infection. On the contrary, in the right eye of a rabbit receiving instillations of antiviral, and in the right eye of the rabbit receiving instillations of bacteriophage, the intensity of the reactions were somewhat more severe and persisted longer than in the left eyes (control) of the same animals which received instilla-

tions of plain broth. While these differences were not very pronounced, we believe that they are significant, since similar deleterious effects were observed by us while studying the effect of bacteriophage on experimental infection in the skin. Subsequent experiments, which are to be reported presently, suggest that this temporary intensification of the local reaction is due in all probability to the presence in the bacteriophage as well as in the antiviral substances capable of increasing the invasiveness of the staphylococcus.³

CONCLUSIONS

1. Instillations of antiviral or bacteriophage into the conjunctival sac are not sufficient to protect the cornea or the anterior chamber of the eye against a severe infection.

2. Direct application of antiviral or bacteriophage is of no value in the treatment of eyes experimentally infected with staphylococci.

3. Furthermore, intensification of the local reaction frequently results from the application of bacteriophage or antiviral to the lesion.

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A NOTE ON THE IMMUNOLOGY OF TRACHOMA*

L. A. JULIANELLE, PH.D.
Saint Louis

Beginning with the original observation of Nicolle, Cuénod, and Blaizot,¹ there have been a number of reports² on the treatment of trachoma by auto-inoculations of trachomatous virus. From such treatment based on the principle of active immunization, other studies have arisen adopting the converse of this concept;³ namely, administration of auto- or "immune" blood, particularly by way of the conjunctiva. While specific therapy of this kind has not been so universal as to supersede the more routine treatment with metallic salts, it has been nevertheless interesting to determine whether the general rationale of specific immunization to trachoma possesses any inherent possibilities establishable by experimental methods.

Previous observations from this laboratory⁴ have already demonstrated that recovery of monkeys from experimental infection does not evoke any measurable degree of immunity, and that the blood of patients⁵ contains no antibodies capable of protection against the experimental disease. Since in both instances, however, the virus of trachoma does not penetrate beyond the conjunctiva, it is possible that the absence of antibody in the general circulation may be as much the result of an inadequate stimulation of the tissues responsible for formation of antibodies as an incompetency of the antigenic activity of the virus. It therefore seemed logical to extend the original studies on

immunity with observations on the antibody response of animals to prolonged artificial immunization.

Accordingly, both rabbits and monkeys (*M. rhesus*) have been immunized by repeated intravenous injections of tissues scraped by grattage from the conjunctiva of patients with clinically active disease. The scraped material was suspended in veal-infusion broth and after trituration under sterile precautions it was injected into the animals. Fresh material was obtained for each administration, and all the animals received 16 injections over a period of two months. Since the majority of tissues employed for the purpose contained inclusion bodies, it is clear that the tissues were not only typical of the disease, but if these structures play any part in the antigenicity of the virus, then any antigenic deficiency dependent upon their presence was precluded. It was not possible, however, to test the activity of the virus used for immunization, since the time required for its determination exceeds the survivability of the infectious agent.⁶ It is a fair assumption, however, as demonstrated repeatedly in the laboratory,⁷ that at least half the tissues utilized were infectious for monkeys. The animals injected were two normal rabbits and two monkeys. The latter were selected because they had recovered from experimental trachoma, thus indicating their susceptibility to the disease and, therefore, their suitability for studies on the formation of immune bodies.

Neutralization tests were subsequently conducted to determine the presence of antibodies in the blood of the animals immunized artificially. Scrapings pooled from several patients were mixed, after grinding, with the sera diluted 1:1, 1:3,

* From the Department of Ophthalmology, Washington University School of Medicine. Conducted under a grant from the Commonwealth Fund of New York.

Presented before the Association for Research in Ophthalmology, Saint Louis, May 16, 1939.

and 1:5. The mixtures were then incubated at 37°C., for periods of 30 or 60 minutes, and agitated from time to time to insure maximum exposure of the suspension to the serum. In each instance, it was noticed that the sera both agglutinated and lysed the human cells in the scrapings. Smears made at the end of the period of incubation revealed a complete disappearance of the red blood cells and less complete but marked lysis of the polymorphonuclear cells, with the lymphocytes more resistant to this lytic action than the other blood constituents. While some of the epithelial cells were in various stages of dissolution, about half of them appeared to be more or less normal. For purposes of control, the tissue suspensions were incubated with equivalent quantities of normal rabbit and normal monkey sera, as well as in physiological saline solution. The lytic effect described in the case of the "immune" sera did not occur in these instances. It is clear, therefore, that the conditions of immunization allowed the formation of antibodies to functionable antigens present in the scrapings.

Following incubation, materials from the different tests were inoculated in monkeys (*M. rhesus*), usually by swabbing the conjunctiva of one eye, and by first pricking the conjunctiva of the opposite eye with a charged needle and then injecting subconjunctivally 0.2 c.c. to 0.4 c.c. of the mixtures.

Seven experiments were conducted as described, and in four the original tissues were not infectious for monkeys. In the remaining three experiments it was found that human tissues inoculated after exposure to sera prepared as outlined retained their full capacity to infect monkeys. The experimental trachomatous infections induced by the "immune" serum-suspension mixtures were in every way similar to those induced by grattage material undergoing similar treatment with

normal sera or broth. The conclusion seems unavoidable, therefore, that prolonged artificial immunization of rabbits, or of monkeys susceptible to trachoma, does not stimulate antibodies capable of neutralizing the virus, as determined by infection in monkeys.

The data suggest, then, that the treatment of patients by autoinoculation of conjunctival scrapings or by administration of their own sera does not appear from the experimental evidence to be an effective method for the control of clinical trachoma. This does not imply, however, that the virus of trachoma is not antigenic; it is more likely that the antigen is of low activity and what antibodies may be formed are beyond the range of detection by the methods now in use. The virus existing, as it does in spontaneous infection, only in close association with the conjunctival and corneal cells—both tissues only mildly concerned, if at all, in the elaboration of antibodies—lack of antibody response in the patient is readily understood. Since even repeated intravenous introduction of the virus into susceptible animals (that is, *M. rhesus*) fails in exerting adequate stimulation for the formation of antibodies, it must be admitted that the virus is at least an impotent antigen.

If, therefore, any implications are justifiable as a result of this study, then one of the most interesting would seem to be that in trachoma is witnessed a remarkable example of exalted parasitism between the virus and the infected tissues. This condition may in turn provide the explanation for the clinical character of the disease. The virus is of low infectivity, incapable of invasion, adapted to a high degree of tissue selectivity or specialization, slow in multiplying, and when removed from its natural environment rapidly inactivated. Consequently, it creates in infection a relatively minor dis-

turbance of the tissues involved. The disease acquires importance not because of its serious infection, but because of the corneal complication and probabilities of varying degrees of visual impairment. The same degree of infection in a less delicate tissue or organ would be of little clinical or pathological importance. In any case, the relatively mild reaction in the localized tissues and the failure to invade beyond the initial portal of entry are insufficient stimuli for the formation of antibodies. Thus, by this very deficiency, pathogenically and antigenically considered, the virus of trachoma maintains

conditions for its indefinite survival, creating in this way a state of almost perfect parasitism (that is, the ability to survive at the expense of a host without stimulating a significantly defensive reaction on the part of the host).

CONCLUSION

Artificial immunization of rabbits and susceptible monkeys, accomplished by repeated intravenous injections of conjunctival scrapings from the eyes of patients with clinically active trachoma, does not stimulate antibodies capable of neutralizing the virus of this infection.

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DISCUSSION

DR. WILLIAM L. BENEDICT (Rochester, Minn.): I should like to ask the author if he has any notion as to whether the low antigenic properties he has demonstrated by his experiment have any bearing on whether or not the etiologic agent of trachoma is really a virus.

DR. LOUIS A. JULIANELLE: There is an unfortunate impression that was caused by Rivers's book on viruses, published about 10 years ago, in which he generalized so thoroughly as to what a virus should be. He flat-footedly states in that book that all viruses are very fine anti-

gens and the result is that recovery from a virus disease gives a life-lasting immunity.

At that time we did not know many viruses, and the statement was about 90 percent true. Today, it is about 60 percent true. We have come to know a number of viruses since then that do not give any measurable immunity or any very extensive immunity. I think, therefore, that one cannot define the nature of an infectious agent by the extent of immunity alone.

VITAMIN-D COMPLEX IN PROGRESSIVE MYOPIA*

ETIOLOGY, PATHOLOGY, AND TREATMENT PRELIMINARY STUDY

ARTHUR ALEXANDER KNAPP, M.D.
New York

The etiology of progressive myopia has always been a problem. The theories that have been advanced may be divided into groups characterizing the etiology as mechanical, hereditary, and acquired. Under the acquired causes vitamin deficiency has been mentioned without being emphasized. From experimental work which Blackberg and I have done on dogs in the Department of Pharmacology, Columbia University,¹ and from clinical application of these laboratory findings, it seems that vitamin deficiency deserves greater stress in considering the etiology of progressive myopia. The improvement that has been shown in myopia treated from this standpoint has been so encouraging that we may hope that the cause of this visual defect is nearer solution. It is with this thought in mind that this brief report is made. Further, it is hoped this paper may act as a stimulus to other observers to check our results.

✓Rohmer and Bezsnoff² have said "The clinical recognition of vitamin deficiency states is no longer confined to the diagnosis of the classical picture. Knowledge must be extended to the recognition of the 'Forme Frustes' by a greater appreciation of how the specific vitamin functions in maintaining nutritional balance under normal and pathologic conditions." Strebel³ has shown that the normal sclera is rich in calcium. Buffington,⁴ in a discussion of myopia, states "Calcium deficiency is often present in progressive myopia." Fourteen out of 15 cases

of progressive myopia examined by Fleming⁵ showed a low blood calcium. Wood⁶ has found calcium deficiency in rapidly advancing myopia. Walker⁷ and Sorsby et al,⁸ too, are of the opinion that myopia is scleral rickets. *

The production of axial myopia in the experimental animal presents intrinsic difficulties, but it seems that it is not an entirely impossible task. Tron⁹ has shown that the anteroposterior diameter of the eyeball cannot be used as a criterion, for emmetropic, hyperopic, and axial myopic eyes show wide individual variations. The fact is, the myopic eye may have an even smaller anteroposterior diameter than the hyperopic. Nor does retinoscopy in the presence of ectasia of the cornea offer any aid in the laboratory animal. Hence, we must content ourselves with indirect evidence of the presence of induced myopia in the animal.

✓Prominence of the eyes, wide palpebral fissures, and deep anterior chamber are very frequently associated with axial myopia in the human. Keratoconus and complicated cataract are unusual findings. All of our animals, fed a deficient vitamin-D-low-calcium diet, developed these eye changes. They may be interpreted as suggestive of the presence of myopia. Ectasia of the cornea, alone, may be sufficient to cause myopia. True axial myopia, the type usually seen in man, is particularly characterized by stretching of the sclera. Sir Arthur Keith¹⁰ remarks, "If the sclerotic fibroblasts lay sound material and lay it rightly, then all is well, whatever be the usage we give our eyes. But, if the ma-

* Presented before the Association for Research in Ophthalmology in Saint Louis, May 16, 1939.

terial is unsound and laid wrongly, then it is possible that forces which leave the normal eye unaffected may damage the abnormal eye."

Clinically, our rachitic dogs manifested primary ectasia of the cornea. Histologic examination of the membrane showed definite pathology which grew progressively worse with the advancement of the deficiency. Edema of the substantia propria and irregularity of the lamellae were the principal changes. The sclera showed a similarly altered structure (figs. 1 and 2). These abnormal findings are an expression of the weakened fibrous tunic. Wood¹¹ has said "When the cornea gives way, the sclera does also." Argañaraz¹² regards axial myopia as having the same origin as primary ectasia of the cornea. In a recent study of 18 human eyes¹³ I have shown that the vitamin-D complex is to be considered in the etiology of keratoconus.

A careful consideration of the clinical and pathologic findings in our animals leads to the conclusion that myopia probably has been induced in them by feeding a deficient vitamin-D-low-calcium diet.

Assuming a disorder of the vitamin-D-complex metabolism to be a basic factor in the etiology of myopia, certain facts readily are explained: The rarity of myopia in the American Indian; the fact that the rural inhabitant is freer from this complaint than is his city brother; that fewer myopic eyes are found in high altitudes; the prevalence of myopia in China. As for monocular myopia, it is Wiener's belief¹⁴ that it cannot be considered as an entity separate from the binocular variety. It may be that our greater food-consciousness, especially in relation to vitamin supply, explains why we are seeing fewer cases of progressive myopia today.

From thousands of cases at the New York Eye and Ear Infirmary, and from

some in my private practice, I have selected 53 patients for this study. Their periods of observation varied from 5 to 28 months. All of them were chosen because it was believed that their myopia would progress. Their age and past and present refractive errors were considered. The ages were from 3 to 20 years. Their myopia ranged from $-0.25D.$ to $-41D.$ Vitamin D, in the form of Viosterol, and calcium, in the form of Mineral Mixture Tablets were prescribed.¹⁵ Dosage of the latter varied with the milk intake. If a patient drank one quart of milk daily, one tablet was prescribed. For each glass less than this, two tablets were added. During the first three months the majority had been taking their medication three times a day, after meals. After that time, the tablets were prescribed before breakfast, all in one dose, and the Viosterol, 60 drops, after the meal. This changed routine was adopted because it has been found that calcium is best absorbed in an acid medium. Otherwise, the patients' diet and regimen were unchanged.

The cycloplegic employed for the refractions previous to my supervision, in most cases, was not known. The atropine tests were made after the patients had had one drop of 1-percent atropine three times daily for three days, and a tenth drop on the morning of examination. Blood-serum calcium and phosphorus investigations were made in a few patients; but in too few to permit any conclusion to be drawn. Because of the laboratory limitations, more calcium and phosphorus studies were not obtained. It would be of value to carry on further research in myopia along these lines, to determine the blood-serum calcium and phosphorus, the amount of diffusible and nondiffusible calcium, and also the ionizable fraction. In addition, calcium-balance studies would be interesting, with a check of the urinary and fecal output.

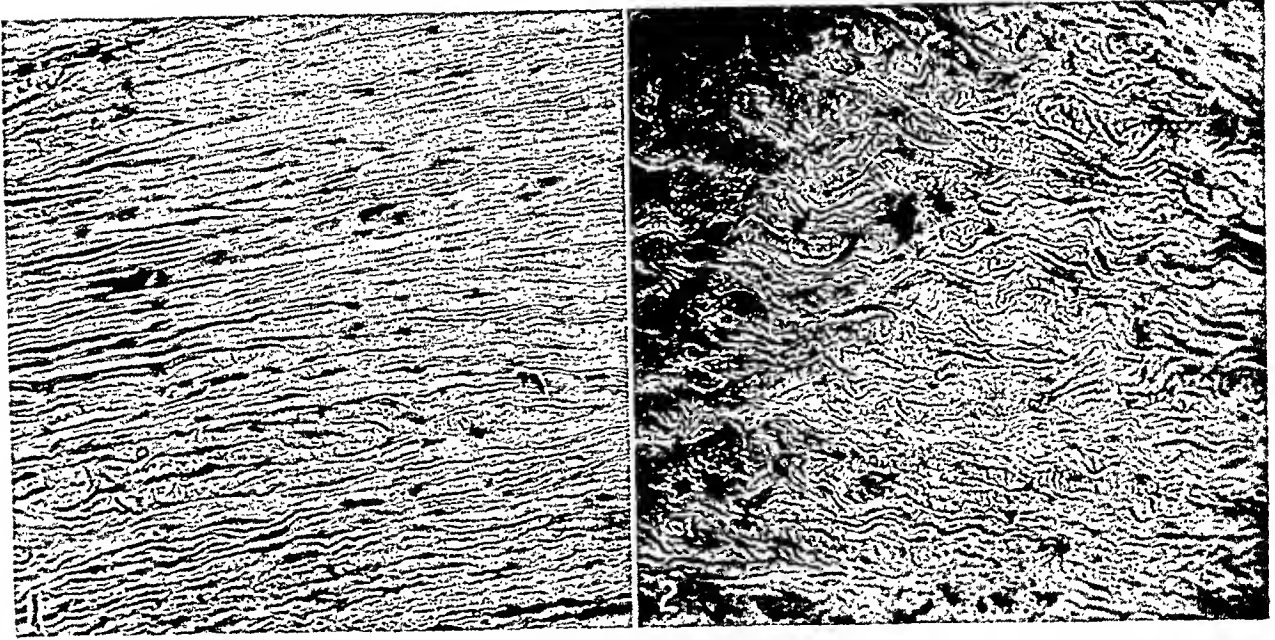


Fig. 1 (Knapp). Normal sclera of the dog.

Fig. 2 (Knapp). Corresponding area of sclera of dog after it had been on vitamin-D deficient, low-calcium diet for seven months, showing edema and irregularity of fibers.

RESULTS

Of the 53 cases, insufficient data were obtained on 7. In the remaining 46, only 12 patients took their medication regularly. Six of these 12 showed a reduction in their myopia; 2 remained stationary, 4 progressed. Considering the 46 patients, without regard to the regularity of medication, we find that 16, or 34.72 percent, had a reduction in their myopia; 7 of them, or 15.19 percent, remained stationary; 21, or 45.57 percent, progressed; and 2, or 4.34 percent, displayed a decrease of myopia in the left eye and a progression in the right. In other words, 66.67 percent of the patients who regularly took their medication either manifest a reduction in their myopia, or remained stationary. Taking into consideration the entire series, 50 percent revealed either a reduced myopia or were unchanged on reexamination.

To check further the influence of the administration of the vitamin-D complex on the human fibrous tunic, measurements of the cornea and the exposed scleral segment were made from plaster-of-Paris casts of the eyes with anterior-

curvature myopia before and after treatment with vitamin D and calcium. These figures were computed by Professors Carlos de Zafra and Louis Granath of the engineering and physics departments, respectively, of New York University. Very accurately they have shown that the cornea and the sclera, too, actually may shrink following this therapy. Scleral shrinkage also was found in both eyes of a patient with progressive myopia of 20.0 D., who, after the treatment period of eight months showed a reduction of 2.0 D. Clinically, this fact is well illustrated by two of the patients, who, without loss of weight or evident pathology of the levator palpebralis, developed a ptosis following the medication.

One of our patients, case 16, had been taking the Viosterol and Mineral Mixture Tablets for eight months. Atropine retinoscopy then showed less myopia in both eyes. After the patient had been without the prescribed therapy for eight months, atropine retinoscopy indicated an increase. Following another eight months of persistent taking of the medication, the condition again revealed

TABLE 1*
DATA ON VITAMIN D COMPLEX IN PROGRESSIVE MYOPIA

NAME	AGE	DATE	PREVIOUS REFRACTIONS BEFORE THERAPY	DATE	INITIAL ATROPINE REFRACTIONS RETINOSCOPY ACCEPTANCE AT ONE METER	VISION	DATE	SUBSEQUENT ATROPINE REFRACTIONS RETINOSCOPY ACCEPTANCE AT ONE METER	VISION	PERIOD OF OBSERVATION	REGULARITY OF MEDICATION	REMARKS
1. C.H.	20	1935	O.D. -2.00 X 1.00 X 1.00 O.S. -2.00 SPH.	1/19/35	O.D. -4.00 X 2.00 X 1.00 O.S. UNIMPROVED X 1.00 HAND MOVE MENTS AT 6 INCHES.	20/70	1/19/35	O.D. -32.00 -2.00 X 15 O.S. UNIMPROVED O.D. -31.00 -2.00 X 15 O.S. UNIMPROVED O.D. -29.00 -1.00 X 15 O.S. -28.00 -1.00 X 15	20/70 15/50 15/50	28 MONTHS	REGULAR	PATIENT HAS A MYOPIC CENTRAL CHORIORETINITIS AND COMPLICAT- ING CATARACT OF BOTH EYES. ACHE OF FACE HAS DISAPPEARED
2. M.C.	10	2/2/32	-13.00 -11.00	3/16/35	-14.75 -13.50	20/40 +	11/2/35	-15.25 -13.50	20/40 +	17 MONTHS	REGULAR	AFTER THREE MONTHS NOTICED THAT VISION WAS IMPROVED WITH AND WITH- OUT GLASSES. SLEEPS BETTER. CONVERTED STRABISMUS. MISSED THREE DOSES OF MEDICATION PRIOR TO 4/1/35 REFRACTION
3. A.A.	6	4/20/34	-11.00 O.U.	7/5/35	-12.00 -11.25	20/40	9/22/35	-11.50 -10.75	20/40	25 MONTHS	REGULAR	GOO-LIVER OIL INTERMITTENTLY FOR NIGHTS PRIOR TO EXAM. SEES BETTER WITHOUT GLASSES. NOT SO SLEEPS AND EATS BETTER. NOT SO FIDDLY AND NERVOUS. HAD MEASLES
4. F.A.	15		HAS O.D. -12.50 -1.00 X 1.00 O.S. -10.50 -1.00 X 1.00	5/15/35	-12.00 -10.75	20/40	10/8/35	-12.00 -11.00	20/40	5 MONTHS	REGULAR	SEES BETTER WITHOUT GLASSES. PEPPIER. GENERAL FEELING OF IM- PROVED HEALTH
5. A.A.	9			5/11/35	-14.00 -12.75	20/70	10/5/35	-13.50 -12.75	20/50+	5 MONTHS	REGULAR	SEES BETTER WITHOUT GLASSES
6. S.V.	9	4/24/34	O.D. -10.00 SPH. O.S. -10.00 -1.00 X 1.00	1/10/35	-10.25 -9.25	20/40	11/20/35	-9.50 -8.50	20/40	7 MONTHS	REGULAR	SEES BETTER WITHOUT GLASSES. IM- PROVED APPETITE; PLAYS MORE
7. L.V.	6	10/25/34	-1.25	2/2/35	-2.50 -2.25	20/40	8/27/35	-2.75 -2.25	20/40	8 MONTHS	REGULAR	SEES BETTER WITHOUT GLASSES. FLESH FIRMER. HAS TAKEN CALCIUM AFTER MEALS
8. M.D.	9		HAS O.D. -1.50 SPH. (OLD PAIR) AND O.D. -5.00 -3.00 X 1.00 O.S. -4.00 -3.00 X 1.00	2/16/35	-10.00 -9.00	20/40	11/9/35	-10.00 -9.00	20/40	6 MONTHS	REGULAR	
9. S.P.	9			3/2/35	-10.00 -9.00	20/40	11/2/35	-10.00 -9.00	20/40	8 MONTHS	IRREGULAR	HISTORY OF ALLERGY IN FAMILY. MOTHER HAS BILATERAL POSTERIOR POLAR CATARACTS. BLEEDER. HAS BEEN TAKING CALCIUM. BLEPHARITIS HAS CLEARED. FEELS BETTER. MEDICATION MISSED 2 MONTHS
10. R.L.	5	10/9/32	-3.00 -2.00	4/19/35	-7.00 -6.25	20/40	10/8/35	-7.00 -6.25	20/40	6 MONTHS	IRREGULAR	ESOTROPIA. MEDICATION MISSED SEVEN WEEKS. UNCOMMITTIS

No.	NAME	AGE	SEX	DATE	PREVIOUS REFRACTIONS BEFORE THERAPY	DATE	INITIAL ATROPHIC REFRACTION RETINOSCOPY ACCEPTANCE	VISOR	MEDICATION	DATE	SUBSEQUENT ATROPHIC REFRACTIONS RETINOSCOPY ACCEPTANCE	PERIOD OF OBSERVATION	REGULARITY OF MEDICATION	REMARKS
11	A.H.	17	M	11/1/32 4/26/33 9/4/34	O.D. -4.00 -1.25 X 180 O.S. -2.00 -1.75 X 180 O.D. -2.00 -1.75 X 180 O.S. -2.00 -1.75 X 180	2/9/35	AT ONE METER -4.50 -1.25 -3.25 ACCEPTANCE O.D. -1.50 -1.25 X 180 O.S. -1.25 -1.25 X 180	20/20 20/20 20/20	VIOSTEROL GITS LX M.M. TABS V	12/8/35	-1.00 -2.50 -2.25 ACCEPTANCE O.D. -3.75 -1.75 X 180 O.S. -3.00 -1.25 X 180	10 MONTHS	IRREGULAR	BETTER. SLEEP IMPROVED. NO MORE TALKING. MEDICATION MISSED 2 MONTHS
12	J.S.	7	M	11/19/34	O.D. -2.25 CYL AX. 90 O.S. -1.25 CYL AX. 90	3/8/35	-4.00 -1.25 -2.25 ACCEPTANCE O.D. -1.75 -1.75 X 110 O.S. -1.25 -1.25 X 110	20/20 20/20	VIOSTEROL GITS LX M.M. TABS IV	11/30/35	+1.00 -1.75 O.D. -1.00 -1.75 X 100 O.S. -1.25 -1.25 X 100	8 MONTHS	IRREGULAR	MOTHER REPORTED THAT CHILD SUFFERED FROM "BOILS" IN THE CORNER OF EACH EYE. ON HIS FACE, NECK, AND LEGS. LESIONS DISAPPEARED SHORTLY AFTER MEDICATION HAD BEEN DISCONTINUED. MEDICATION MISSED 3 MONTHS
13	A.R.	8	F	9/21/33	-6.00 -6.00 -3.00 -3.00	1/4/35	-7.00 -1.25 -4.25 ACCEPTANCE O.D. -3.25 -3.00 X 15 O.S. -3.25 -3.00 X 15	20/40 20/40	VIOSTEROL GITS LX M.M. TABS III	12/3/35	-7.00 -1.25 -4.25 ACCEPTANCE O.D. -3.25 -3.00 X 15 O.S. -3.25 -3.00 X 15	11 MONTHS	IRREGULAR	APETITE IMPROVED. MUCH BETTER-BEHAVED CHILD. INCREASED VISUAL ACUITY WITHOUT GLASSES. MEDICATION MISSED THREE MONTHS
14	J.B.	9	M	11/26/34	-7.75 -7.75	4/6/35	-1.00 -1.00 O.D. -2.10 SPH. 20/20 O.S. -2.00 SPH. 20/20	20/20 20/20	VIOSTEROL GITS LX M.M. TABS IV	12/26/35	-7.75 -1.25 O.D. -1.75 SPH. 180 O.S. -1.75 SPH. 180	8 MONTHS	IRREGULAR	VISION IMPROVED. FEELS FINE. MEDICATION MISSED 2 MONTHS
15	S.A.	8	F	11/27/34	O.D. -2.25 SPH. O.S. -1.25 SPH.	4/8/35	-1.75 -1.25 -1.00 ACCEPTANCE O.D. -2.25 -1.50 X 180 O.S. -1.75 -1.25 X 180	20/20 20/20	VIOSTEROL GITS LX M.M. TABS II	12/28/35	-1.50 -1.00 O.D. -2.50 SPH. 180 O.S. -1.50 -1.25 X 180	8 MONTHS	IRREGULAR	VISION INCREASED WITHOUT GLASSES. MEDICATION MISSED 2 MONTHS
16	G.S.	4	F	3/12/35		3/12/35	-6.50 -1.00 -3.00 ACCEPTANCE O.D. -2.25 -1.50 X 180 O.S. -1.75 -1.25 X 180	20/20 20/20	VIOSTEROL GITS LX M.M. TABS III	11/23/35 9/19/36 5/22/37	-5.75 -1.25 -3.00 -1.25 -2.25 -1.25 O.D. -2.25 -1.25 X 180 O.S. -2.25 -1.25 X 180	26 MONTHS	IRREGULAR	COULD GET ALONG WITHOUT GLASSES, WHEN PREVIOUSLY COULD NOT. MARKED IMPROVEMENT IN APETITE. EXOTROPIA. MEDICATION MISSED ONE MONTH
17	D.L.	10	F	3/21/35	HAS O.D. -3.00 CYL AXIS 174 O.S. -3.50 CYL AXIS 178	3/21/35	-3.25 -2.00 -1.25 ACCEPTANCE O.D. -4.25 CYL. AX. 8 O.S. -3.25 CYL. AX. 165	20/20 20/20	VIOSTEROL GITS LX M.M. TABS III	11/14/35	-2.50 -1.25 -1.50 ACCEPTANCE O.D. -3.75 -1.75 X 180 O.S. -3.75 -1.75 X 180	8 MONTHS	IRREGULAR	NOW ABLE TO READ WITHOUT GLASSES. G. G. BEING IDEAL WITH PROPORTIONAL WEIGHT INCREASE. MEDICATION MISSED 1 MONTH
18	M.S.	9	F	12/3/31 3/21/33 1/20/34	O.D. -6.50 SPH. O.S. -7.50 SPH. O.D. -8.00 SPH. O.S. -10.00 SPH.	2/28/35	-7.50 -10.50 -6.50 SPH. O.S. -11.00 SPH.	20/20 20/20	VIOSTEROL GITS LX M.M. TABS V	11/23/35	-7.00 -8.75 O.D. -8.00 SPH. O.S. -9.50 SPH.	9 MONTHS	IRREGULAR	IMPROVED VISION WITHOUT GLASSES. LEE'S NERVOUS THAN PREVIOUSLY. MEDICATION MISSED ONE MONTH
19	L.B.	9	F	1/20/34	-5.50 -5.50 O.D. -1.50 SPH. O.S. -1.50 SPH.	1/22/35	-2.50 -2.25 O.D. -3.00 SPH. O.S. -2.75 -2.25 X 180	20/20 20/20	VIOSTEROL GITS LX M.M. TABS VI	11/23/35	-2.25 -2.25 O.D. -3.00 SPH. O.S. -2.75 -2.25 X 180	10 MONTHS	REGULAR	FOR YEAR PREVIOUSLY HAD BEEN TAKING TWO PELLETS OF COD-LIVER OIL DAILY. APETITE AND SLEEP IMPROVED. HAD MEASLES
20	G.L.	7	M	10/6/34	O.D. -2.00 CYL. AX. 25 O.S. -2.50 SPH.	1/19/35	-3.25 -2.00 -1.75 ACCEPTANCE O.D. -2.00 -1.75 X 180 O.S. -2.25 -1.75 X 180	20/20 20/20	VIOSTEROL GITS LX M.M. TABS IV	11/8/35	-3.25 -2.00 -1.75 ACCEPTANCE O.D. -3.50 -2.25 X 180 O.S. -3.25 -2.25 X 180	10 MONTHS	IRREGULAR	APETITE AND SLEEP IMPROVED. MORE ALERT IN SCHOOL. VISION IMPROVED. MEDICATION MISSED 2 MONTHS
21	M.G.	10	M	3/15/34	O.D. -1.75 SPH. O.S. -1.75 SPH.	3/19/35	-2.50 -2.00 -1.75 ACCEPTANCE O.D. -3.50 -2.25 X 180 O.S. -3.25 -2.25 X 180	20/20 20/20	VIOSTEROL GITS LX M.M. TABS IV	12/7/35	-2.50 -2.00 O.D. -3.50 -2.25 X 180 O.S. -3.25 -2.25 X 180	9 MONTHS	IRREGULAR	MEDICATION MISSED TWO MONTHS
22	G.N.	5	F	3/7/35		3/7/35	-2.00 -6.75 -3.25 ACCEPTANCE O.D. -2.00 -1.50 X 10 O.S. -1.50 -1.50 X 10	20/20 20/20	VIOSTEROL GITS LX M.M. TABS III	11/7/35	-2.00 -6.75 -3.25 ACCEPTANCE O.D. -2.00 -1.50 X 10 O.S. -1.50 -1.50 X 10	8 MONTHS	REGULAR	HAD MUMPS AND TONSILLITIS
23	K.K.	13	F	8/7/33	O.D. -8.00 -1.50 X 10 O.S. -8.00 -1.50 X 10	1/3/35	-9.25 -10.00 -7.50 ACCEPTANCE O.D. -8.50 -1.50 X 10 O.S. -8.00 -1.50 X 10	20/20 20/20	VIOSTEROL GITS LX M.M. TABS VI	2/14/35	-9.00 -9.75 -7.25 ACCEPTANCE O.D. -8.50 -1.50 X 10 O.S. -8.00 -1.50 X 10	8 MONTHS	IRREGULAR	VISION IMPROVED WITHOUT GLASSES. OCTS ABOUT BETTER WITHOUT THEM. MEDICATION MISSED 1 MONTH

Ed. Note: The following corrections and addenda were sent in by the author after cuts of the table had been made:

Headings of columns 8 and 11 should read "Retinoscopy and Acceptance."
Case 2: 4/1/36, -13.50 instead of -18.00.

Case 16: under Remarks, last sentence reads "Medication missed one month in first 8 months." Delete first date (5th col.).

Case 21: under Previous refractions before therapy, add 20/20 for both O.D. and O.S.

Case 32: under Date (5th col.) change to 11/16/34.

Case 46: Under Subsequent atropine refractions Retinoscopy and Acceptance the first examination was made 6/28/35
-3.00 -2.50 {slant of broken line}
-2.50 -2.50 {same as below}
O.D. -3.50 -1.50 X 180 20/20
O.S. -3.50 -1.50 X 15 20/20
under Period of observation, 18 months instead of 20
under Remarks, add "Now vision without glasses improved."

TABLE I
DATA ON VITAMIN D COMPLEX IN PROGRESSIVE MYOPIA

No.	Sex	Age	Sex	Date	Previous Refraction Before Therapy	Initial Atropine Refraction Retinoscopy Acceptance	Medication	Date	Subsequent Atropine Refraction Retinoscopy Acceptance	Vision	Period of Observation	Regularity of Medication	Remarks
24	A.C.	10	M	2/27/34	O.D. -1.50 X 1.50 SPM. O.S. -1.50 SPM.	-1.00 O.D. -2.00 SPM. O.S. -2.00 SPM.	Vioosterol O.D. LX U.I. TABS Vill	11/27/35	-1.00 O.D. -2.00 SPM. O.S. -2.00 SPM.	20/20 20/20	8 1/2 MONTHS	IRREGULAR	VISION BETTER WITHOUT GLASSES MISSED ONE MONTH. CALCIUM TAKEN AFTER MEALS
25	M.C.	13	M	2/13/34	O.D. -2.00 X 1.50 X 1.00 O.S. -1.50 X 1.50 X 1.70	-2.00 O.D. -2.00 O.S. -1.75 X 1.50 X 1.70	Vioosterol O.D. LX U.I. TABS Vill	8/3/35	-2.00 O.D. -2.00 O.S. -1.75 X 1.50 X 1.70	20/20 20/20	6 MONTHS	IRREGULAR	VISION IMPROVED WITHOUT GLASSES. MEDICATION MISSED ONE MONTH
26	G.L.	6	M	5/2/35		-2.50 O.D. -2.50 O.S. -2.50	Vioosterol O.D. LX U.I. TABS Vill	12/22/35	-2.50 O.D. -2.50 O.S. -2.50	20/20 20/20	7 1/2 MONTHS	IRREGULAR	MISSED MEDICATION TWICE WEEKLY AND ONE MONTH CONSECUTIVELY
27	S.P.	15	M	4/21/34	NAS O.D. -5.00 SPM. O.S. -5.50 SPM. Accepts O.D. -6.00 X 1.00 X 1.00 O.S. -7.00 X 1.00 X 1.00	-4.75 O.D. -10.50 X 3.00 X 1.50 O.S. -8.75 X 1.25 X 1.5	Vioosterol O.D. LX U.I. TABS Vill	11/20/35	-4.75 O.D. -10.50 X 3.00 X 1.50 O.S. -8.75 X 1.25 X 1.5	20/100 20/20	9 1/2 MONTHS	IRREGULAR	MISSED THREE MONTHS MEDICATION
28	G.F.	9	F	1/12/34	O.D. -1.75 X 1.25 X 1.00 O.S. -1.50 SPM.	-1.50 O.D. -2.25 X 1.25 X 90 O.S. -2.25 SPM	Vioosterol O.D. LX U.I. TABS Vill	12/12/35	-2.50 O.D. -3.25 X 1.25 X 90 O.S. -3.50 SPM.	20/20 20/20	9 MONTHS	IRREGULAR	MISSED TWO MONTHS MEDICATION. CALCIUM TAKEN AFTER MEALS
29	M.O.	13	M	1/13/34	O.D. -4.50 X 1.50 X 1.00 O.S. -4.75 X 1.50 X 1.00	-4.75 O.D. -5.25 X 1.50 X 1.00 O.S. -5.75 X 1.25 X 1.00	Vioosterol O.D. LX U.I. TABS Vill	11/30/35	-5.25 O.D. -6.00 X 1.25 X 1.00 O.S. -6.00 X 1.25 X 1.00	20/20 20/20	9 MONTHS	IRREGULAR	MISSED TWO MONTHS MEDICATION. CALCIUM TAKEN WITH MEALS. PSEUDOMONITIS O.U.
30	A.R.	3	F	10/7/34		-10.50 O.D. -10.50 O.S. -10.50	Vioosterol O.D. LX U.I. TABS Vill	12/12/35	-11.00 O.D. -11.00 O.S. -11.00	20/20 20/20	11 MONTHS	IRREGULAR	VISION IMPROVED WITHOUT GLASSES MISSED FOUR MONTHS MEDICATION
31	O.F.	7	F	10/14/33 10/9/34	O.D. -1.75 X 4.00 X 3 O.S. -1.75 X 4.00 X 1.75 O.D. -2.25 X 4.00 X 3 O.S. -2.25 X 4.00 X 1.75	-5.50 O.D. -5.50 O.S. -5.50	Vioosterol O.D. LX U.I. TABS Vill	12/20/35	-6.00 O.D. -6.00 O.S. -6.00	20/20 20/20	9 1/2 MONTHS	IRREGULAR	SLEEP IMPROVED. MISSED THREE MONTHS MEDICATION
32	V.C.	9	F	2/26/35	O.D. -2.00 SPM. O.S. -1.75 SPM.	-1.00 Acceptance UNSATISFACTORY	Vioosterol O.D. LX U.I. TABS Vill	8/21/35	-1.25 O.D. -1.25 O.S. -1.25	20/20 20/20	6 MONTHS	IRREGULAR	SLEEP AND APPETITE IMPROVED. MEDICATION MISSED ONE MONTH
33	M.H.	9	M	10/5/34	O.D. -1.50 SPM. O.S. -1.50 CIL. X 1.00	-2.25 O.D. -2.25 O.S. -2.25	Vioosterol O.D. LX U.I. TABS Vill	10/7/35	-2.25 O.D. -2.25 O.S. -2.25	20/15 20/15	8 MONTHS	IRREGULAR	VISION IMPROVED WITHOUT GLASSES. FEWER GLASSES THAN PREVIOUSLY. MISSED MEDICATION 11 MONTHS
34	G.P.	13	F	11/7/34	O.D. -4.00 X 1.75 X 1.00 O.S. -4.00 X 1.00 X 1.00	-3.75 O.D. -3.75 O.S. -3.75	Vioosterol O.D. LX U.I. TABS Vill	12/3/35	-4.50 O.D. -4.50 O.S. -4.50	20/20 20/20	9 1/2 MONTHS	IRREGULAR	MEDICATION MISSED FOUR MONTHS
35	M.R.	11	M	3/11/33 4/16/34	O.D. -2.50 SPM. O.S. -3.00 X 1.00 X 1.75 O.D. -3.00 X 1.00 X 1.75 O.S. -3.25 X 1.00 X 1.75	-5.00 O.D. -5.00 O.S. -5.00	Vioosterol O.D. LX U.I. TABS Vill	12/24/35	-5.00 O.D. -5.00 O.S. -5.00	20/20 20/20	10 MONTHS	IRREGULAR	VISION, APPETITE, AND SLEEP IMPROVED. MISSED THREE MONTHS MEDICATION. CALCIUM TAKEN WITH MEALS
36	D.S.	12	F	1/27/34	O.D. -5.25 SPM. O.S. -4.50 SPM.	-4.75 O.D. -5.75 SPM. O.S. -5.50 SPM.	Vioosterol O.D. LX U.I. TABS Vill	11/20/35	-4.75 O.D. -5.75 X 1.25 X 1.00 O.S. -5.50 SPM.	20/20 20/20	9 1/2 MONTHS	IRREGULAR	MEDICATION MISSED THREE MONTHS

NO.	NAME	AGE	SEX	DATE	PREVIOUS REFRACTIONS BEFORE THERAPY	DATE	INITIAL ATROPINE REFRACTION RETINOSCOPY ACCEPTANCE VISION	MEDICATION	DATE	SUBSEQUENT ATROPINE REFRACTIONS RETINOSCOPY ACCEPTANCE VISION	PERIOD OF OBSERVATION	REGULARITY OF MEDICATION	REMARKS
37	L.Z.	10	F	4/18/34 10/19/34	$\begin{matrix} -1.50 & -1.50 \\ 0.D. & -2.00 & -1.00 \\ 0.S. & -2.25 & -1.00 \end{matrix}$	2/28/35	$\begin{matrix} -1.00 & -1.00 \\ 0.D. & -2.00 & -1.00 \\ 0.S. & -2.25 & -1.00 \end{matrix}$	VIOSTEROL OTTS LX M.M. TABS. VI	8/13/35	$\begin{matrix} -1.50 & -1.50 \\ 0.D. & -2.25 & -1.50 \\ 0.S. & -2.50 & -1.50 \end{matrix}$	5 1/2 MONTHS	REGULAR	CALCIUM TAKEN AFTER MEALS
38	L.R.	7	F	3/3/34	$\begin{matrix} 0.D. & -3.00 & -1.25 & X & 90 \\ 0.S. & -3.00 & -1.25 & X & 90 \end{matrix}$	2/2/35	$\begin{matrix} -2.75 & -3.00 \\ 0.D. & -3.75 & -2.25 & X & 90 \\ 0.S. & -4.25 & -2.25 & X & 90 \end{matrix}$	VIOSTEROL OTTS LX M.M. TABS. V	9/14/35	$\begin{matrix} -3.00 & -3.50 \\ 0.D. & -4.25 & -2.50 & X & 90 \\ 0.S. & -4.50 & -2.50 & X & 90 \end{matrix}$	7 MONTHS	REGULAR	CALCIUM TAKEN WITH MEALS
39	M.S.	12	M	10/26/34	$\begin{matrix} 0.D. & -2.75 & S.P.H. \\ 0.S. & -2.75 & S.P.H. \end{matrix}$	3/12/35	$\begin{matrix} -2.25 & -2.25 \\ 0.D. & -3.25 & -2.25 & X & 180 \\ 0.S. & -3.25 & -2.25 & X & 180 \end{matrix}$	VIOSTEROL OTTS LX M.M. TABS IV	11/30/35	$\begin{matrix} -2.50 & -2.50 \\ 0.D. & -3.25 & -2.50 & X & 180 \\ 0.S. & -3.50 & -2.50 & X & 180 \end{matrix}$	8 1/2 MONTHS	IRREGULAR	VISION IMPROVED WITHOUT GLASSES MEDICATION MISSED 2 1/2 MONTHS
40	R.Z.	10	M	12/27/34	$\begin{matrix} 0.D. & -1.25 & S.P.H. \\ 0.S. & -1.25 & S.P.H. \end{matrix}$	2/16/35	$\begin{matrix} -0.25 & -0.75 \\ 0.D. & -1.25 & S.P.H. \\ 0.S. & -1.75 & S.P.H. \end{matrix}$	VIOSTEROL OTTS LX M.M. TABS V	10/26/35	$\begin{matrix} -0.75 & -1.00 \\ 0.D. & -1.75 & S.P.H. \\ 0.S. & -2.00 & S.P.H. \end{matrix}$	8 1/2 MONTHS	IRREGULAR	VISION IMPROVED. MEDICATION MISSED TWO MONTHS
41	F.J.	9	F	8/29/34	$\begin{matrix} 0.D. & -1.25 & S.P.H. \\ 0.S. & -1.00 & -1.50 & X & 150, \end{matrix}$	3/5/35	$\begin{matrix} -1.25 & -1.25 \\ 0.D. & -2.00 & -2.50 & X & 180 \\ 0.S. & -1.75 & -2.50 & X & 180 \end{matrix}$	VIOSTEROL OTTS LX M.M. TABS IV	11/8/35	$\begin{matrix} -1.50 & -1.50 \\ 0.D. & -2.25 & -1.25 & X & 180 \\ 0.S. & -2.00 & -1.25 & X & 180 \end{matrix}$	8 MONTHS	IRREGULAR	BETTER VISION WITHOUT GLASSES MEDICATION MISSED ONE MONTH
42	J.D.	13	M		$\begin{matrix} H.A.S. \\ 0.D. & -1.25 & S.P.H. \\ 0.S. & -1.25 & S.P.H. \end{matrix}$	1/15/35	$\begin{matrix} -0.25 & -1.00 \\ 0.D. & -1.25 & S.P.H. \\ 0.S. & -2.00 & S.P.H. \end{matrix}$	VIOSTEROL OTTS LX M.M. TABS V	8/20/35	$\begin{matrix} -0.75 & -1.25 \\ 0.D. & -1.75 & S.P.H. \\ 0.S. & -2.25 & S.P.H. \end{matrix}$	7 MONTHS	IRREGULAR	VISION IMPROVED WITHOUT GLASSES MEDICATION MISSED 1 1/2 MONTHS
43	D.S.	10	M		$\begin{matrix} H.A.S. \\ 0.D. & -1.50 & S.P.H. \\ 0.S. & -2.00 & S.P.H. \end{matrix}$	3/16/35	$\begin{matrix} -0.75 & -1.00 \\ 0.D. & -1.75 & S.P.H. \\ 0.S. & -2.00 & S.P.H. \end{matrix}$	VIOSTEROL OTTS LX M.M. TABS III	11/9/35	$\begin{matrix} -1.00 & -1.25 \\ 0.D. & -2.00 & -2.50 & X & 90 \\ 0.S. & -2.25 & -2.50 & X & 90 \end{matrix}$	8 MONTHS	IRREGULAR	VISION IMPROVED WITHOUT GLASSES MEDICATION MISSED ONE MONTH. CALCIUM TAKEN AFTER MEALS
44	R.C.	11	F	12/7/34	$\begin{matrix} 0.D. & -1.50 & -1.50 & X & 20 \\ 0.S. & -1.50 & -1.50 & X & 160 \end{matrix}$	2/16/35	$\begin{matrix} -1.00 & -1.00 \\ 0.D. & -1.50 & -1.50 & X & 160 \\ 0.S. & -2.25 & -1.50 & X & 160 \end{matrix}$	VIOSTEROL OTTS LX M.M. TABS VII	12/20/35	$\begin{matrix} -2.25 & -2.50 \\ 0.D. & -2.00 & -1.00 & X & 10 \\ 0.S. & -1.00 & -2.50 & X & 160 \end{matrix}$	10 MONTHS	IRREGULAR	BETTER VISION WITHOUT GLASSES MEDICATION MISSED 3 1/2 MONTHS
45	N.K.	19	M	2/29/29 3/1/33	$\begin{matrix} 0.D. & -6.00 & -1.00 & X & 30 \\ 0.S. & -6.00 & S.P.H. \\ 0.D. & -9.00 & -3.00 & X & 25 \\ 0.S. & -9.00 & -2.00 & X & 165 \end{matrix}$	4/12/35	$\begin{matrix} -12.00 & -10.50 \\ 0.D. & -10.00 & -3.00 & X & 30 \\ 0.S. & -10.00 & -2.00 & X & 165 \end{matrix}$	VIOSTEROL OTTS LX M.M. TABS VIII	11/10/35	$\begin{matrix} -12.25 & -10.50 \\ 0.D. & -10.00 & -3.00 & X & 30 \\ 0.S. & -9.75 & -2.00 & X & 165 \end{matrix}$	6 MONTHS	IRREGULAR	ACHE OF FACE CLEARED. MISSED MEDICATION THREE WEEKS
46	S.M.	11	M		$\begin{matrix} 0.U. & -2.50 & S.P.H. \end{matrix}$	2/4/35	$\begin{matrix} -2.50 & -2.50 \\ 0.D. & -2.75 & -2.50 & X & 165 \\ 0.S. & -3.25 & -2.50 & X & 15 \end{matrix}$	VIOSTEROL OTTS LX M.M. TABS IV	1/2/36 9/14/36	$\begin{matrix} -3.50 & -3.50 \\ 0.D. & -3.50 & -2.75 & X & 180 \\ 0.S. & -3.75 & -2.75 & X & 10 \end{matrix}$ AFTER REGULAR MEDICATION $\begin{matrix} -2.50 & -2.50 \\ 0.D. & -2.75 & -2.25 & X & 165 \\ 0.S. & -3.25 & -2.25 & X & 15 \end{matrix}$	20 MONTHS IRREGULAR FOR 11 MONTHS REGULAR FOR 7 1/2 MONTHS	IRREGULAR FOR 11 MONTHS REGULAR FOR 7 1/2 MONTHS	MEDICATION TAKEN THREE TIMES WEEKLY. FORTY DROPS TABLETS AFTER MEALS

a reduction. Another patient, case 46, only occasionally took his Viosterol and calcium for a period of 11 months. Atropine refraction brought out an increase in the myopia. Subsequent to 7½ months of regular medication there was a definite decrease.

As a result of this treatment, the majority of the patients noticed increased visual acuity for distance and near. Objectively, some showed better vision. They were not so dependent upon their glasses as formerly. For distinct near vision without lenses, they found that reading matter could be held at a greater distance from the eyes. Characteristic poor muscle tonus improved. In none of this series have I noticed irritative conjunctivitis symptomatic of vitamin-D toxicity. The only toxic symptoms observed were anorexia in three patients, nausea and vomiting in two, and a mild skin eruption in two.

CONCLUSIONS

From this study, it appears that a disturbance in the vitamin-D-calcium-phosphorus metabolism is concerned in the

etiology of myopia. In the presence of a calcium imbalance, there may be a weakening of the fibrous tunic, which may give rise to myopia. Once a condition of progressive myopia has been established, treatment with the vitamin-D complex is indicated. The myopic eyes that respond to this therapy may undergo an actual shrinkage of the globe.

For the prevention of the onset of myopia, the vitamin-D complex probably has another field of usefulness. Given a patient showing a diminishing degree of hyperopia, and one who is approaching the axial myopia side, it would be well to fortify his diet with vitamin D and calcium.

Assistance was given by Miss Diana Shrager of the social service department of the New York Eye and Ear Infirmary. My thanks are due the surgeons of the New York Eye and Ear Infirmary for permission to present these patients. To the Mead Johnson Company of Evansville, Indiana, I wish to express my thanks for their generosity in financing this work.

35 East Sixty-fourth Street.

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DISCUSSION

DR. ALLEN GREENWOOD (Boston, Mass.): I would like to ask Dr. Knapp, in regard to his first patient, whether careful slitlamp examinations were made of the lens from time to time? He speaks of the lenses as being cataractous. I was wondering whether he kept careful slit-

lamp records from time to time of those lens changes, if there were any.

DR. ARTHUR ALEXANDER KNAPP: I will publish that case history as a separate entity. It was exceedingly interesting. The eyes were frequently examined with the aid of the slitlamp and a record kept.

UNILATERAL LOSS OF VISION IN NEUROLOGICAL DISEASE*

P. J. LEINFELDER, M.D.
Iowa City, Iowa

Gradual loss of vision in one eye is always an alarming symptom to the patient, and etiologic diagnosis is frequently difficult. Especially is this true in those cases in which external and ophthalmoscopic evidence of ocular or general disease is absent. Usually a diagnosis can be made in such cases only after careful general and neurologic examination, ophthalmoscopic study, estimation of the visual fields, and roentgenographic observation of the orbits, optic canals, and skull. In the roentgenograms, the pituitary fossa and the sphenoidal ridges are of special interest, for in this region pathology most frequently occurs. Repeated observations of the ocular and general condition must be made to determine new signs that would lead to a diagnosis of the underlying etiology. The visual acuity may remain stationary, and all efforts toward localization may fail, but when

vision progressively decreases in the interval between examinations, every effort must be made to determine the pathologic process. Although, on an anatomic basis, unilateral loss of vision can occur only as a result of pathology in a rather limited area at the base of the brain, a relatively large number of conditions can produce the symptom. Thoroughness and repeated observations will aid in obtaining an early diagnosis that will not only point out the causative pathologic condition, but also favor preservation or restitution of vision.

Adenoma of the Pituitary Body. Because, as was pointed out by Cushing,¹ the field of vision in pituitary tumors is frequently diminished first in one eye, unilateral loss of vision is often an early complaint. Headache may be an accompanying symptom, but the visual loss is usually more distressing to the patient. Since prominent, clinical signs of pituitary disease are absent in most cases, the necessity for close study of the visual

*From the Department of Ophthalmology, College of Medicine, State University of Iowa, Iowa City, Iowa.

symptoms is imperative for early diagnosis. The visual fields usually suggest pathology in the region of the sella. In the earliest case, a superior quadrant or partial temporal defect may be noted, while the opposite eye retains a normal field. Vision is diminished in the affected eye even though the peripheral field may extend 10 to 20 degrees from the fixation point, and a central scotoma may not be demonstrated by quantitative perimetry on the tangent screen. It is only in a more advanced stage of the disease that the fellow eye presents a cut in the temporal field. The general effect therefore is not a homologous, bi-temporal field defect, but an incongruous one in which one eye is usually one quadrant in advance of the other. Roentgenographic examination of the sella turcica discloses enlargement of the sella, and erosion of the clinoids is seen in the cases that show only early field changes. The visual-field changes are undoubtedly later manifestations of pituitary-body disease that usually occur only after bone destruction has become quite advanced. Since the presence of a choked disc is unusual in pituitary adenoma and temporal pallor of the nerve heads is inconstant, visual-field studies and roentgenograms of the sella are invaluable signs for the diagnosis of the intracranial lesion. In advanced cases, a marked reduction of vision may be present in one or both eyes. Optic atrophy is then present, and such cases may be mistaken for tabetic atrophy. A negative Wassermann reaction and roentgenograms of the skull eliminate the possibility of error.

Meningioma of the Sphenoidal Ridge. When a meningioma involves the medial aspect of the sphenoidal ridge, encroachment upon the optic nerve is almost axiomatic. Since the growth of these neoplasms is extremely slow, visual acuity may gradually decrease over a period

of years, but a small tumor involving the lesser wing of the sphenoid may produce pressure upon the optic nerve very early. Choked disc may be observed on one or both sides. In the unilateral cases, the papilledema, if present, may occur on the side opposite the tumor because of obstruction by the tumor of the vaginal sheaths at the optic canal. Visual fields may be irregular or may show concentric contraction or a nasal cut in the eye on the side of the tumor. Symptoms of pressure on the third, fourth, fifth, and sixth cranial nerves are sometimes observed. Unilateral exophthalmos is a frequent late complication of the disease. Roentgenograms disclose the typical bony changes in the region of the sphenoidal ridge and one or both optic canals may be narrowed or apparently obliterated.

Multiple Sclerosis. Rapidly progressing unilateral visual loss occurring in a young adult accompanied by a central scotoma but no objective signs of ocular disease may be the first sign of multiple sclerosis. This type of retrobulbar neuritis is usually seen in an otherwise apparently healthy young adult. Visual-field studies disclose a central defect that may vary from a relative one for color to a 10- to 15-degree absolute scotoma. Orbital tenderness is not induced by pressure on the globe. Initial neurologic examination may reveal no evidence of the underlying condition, but complete and repeated study will frequently disclose a change in the peripheral, sensory, or motor systems. Test of the cerebrospinal fluid by the Lange gold method may disclose the typical curve. It must be remembered that multiple sclerosis is a chronic disease characterized by remissions and exacerbations, and acute retrobulbar neuritis may be the earliest manifestation. Other clinical evidence of the disease may not be recognized for a period of years.

Ocular and neurologic literature contains many discussions concerning the etiology of unilateral acute retrobulbar neuritis, but it seems safe to say that the probability is exceedingly great that the young adult with monocular retrobulbar neuritis will later develop evidence of typical neurologic manifestations of multiple sclerosis. Adie² established that the age and sex incidence was the same for uncomplicated acute retrobulbar-neuritis and multiple-sclerosis patients in whom visual symptoms were the first indication of the disease.

In like manner the presence of reduced visual acuity in one eye accompanied by a temporal atrophy of the nerve head should suggest to the examiner the possibility of an old retrobulbar neuritis occurring in multiple sclerosis. In this condition, although the acute process is localized in the optic nerves, the underlying cause is a progressive disease of the central nervous system, and general symptoms and signs eventually occur.

Intracranial Aneurysm. The optic nerve may be compressed by an aneurysm arising from either the internal carotid or the anterior cerebral arteries. Visual loss is progressive but it may be reduced gradually or with relative rapidity. Other symptomatology may be absent in the early stages. Visual fields may show an irregular loss in the inferior half of the field, or there may be a beginning nasal hemianopsia. Roentgenograms may offer little assistance, and a diagnosis may not be possible until additional signs occur as a result of extension. Concurrent with increased failure of vision, extension of the process may cause pressure on the ophthalmic division of the fifth nerve. The resulting severe pain in the eye, forehead, and side of the nose accompanying the loss of vision may lead to a false diagnosis of accessory-nasal-sinus disease with optic neuritis. Sometimes the

severity of the pain and its distribution to the region supplied by one branch of the fifth nerve suggest tic douloureux. Anomalies of rotation may occur when the third, fourth, or sixth nerve is involved. The symptoms other than the visual are characteristically of an intermittent character. These may arise from

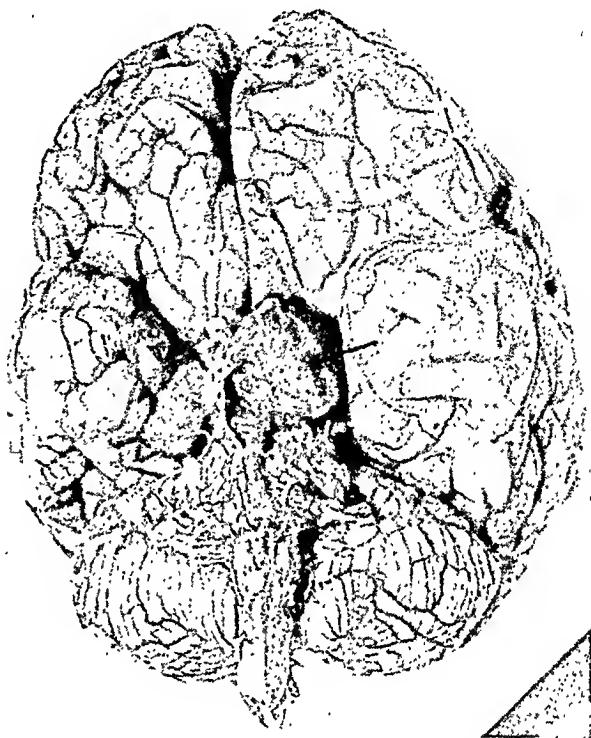


Fig. 1 (Leinfelder). Aneurysm of circle of Willis pressing on left optic tract and nerve. The third, fifth, and sixth nerves were also affected.

intermittent swelling of the aneurysmal sac or from bleeding into adjacent regions. It is often difficult or impossible to make a clinical diagnosis of cerebral aneurysm. A vascular tumor should be suspected in the older patient who has arteriosclerosis, a nasal hemianopsia, and progressive signs of irritation or compression of the second, third, fourth, fifth, and sixth cranial nerves (fig. 1). In the face of progressive signs and symptoms, an exploratory craniotomy may be required to establish definite diagnosis.

The acute onset of marked loss of vision may be the result of hemorrhage

in the region of the chiasma with extension of the hemorrhage to the vaginal sheath of the optic nerve. Hemorrhage may result from spontaneous or traumatic rupture of a normal vessel, a small aneurysm, or of a sclerotic meningeal vessel.

Suprasellar Cyst. These slow-growing neoplasms may in their early stage produce no signs nor symptoms except those



Fig. 2 (Leinfelder). Ventricular shift to right, internal hydrocephalus, and pressure on the optic chiasm by dilated third ventricle. Ependymoma of the left lateral ventricle.

due to changes in the visual fields. Bitemporal hemianopsia is ordinarily associated with suprasellar cysts, but in the event that the cyst has grown more to one side than the other, visual changes will be more pronounced in one eye. The loss of acuity may be due to a central scotoma or to a temporal hemianopsia that has advanced beyond the midline on one side. Differential diagnosis may be extremely difficult. Choked disc usually develops, and erosion of the sella with calcium deposition eventually takes place. Choked discs were not present in two cases seen by the author, and in one of these the visual acuity gradually dimin-

ished, more rapidly in one eye, incident to an increasing incongruous bitemporal hemianopsia. Because of developing optic atrophy, an exploratory operation was made at which a suprasellar cyst was exposed.

Internal Hydrocephalus. Internal hydrocephalus, due to obstruction of the aqueduct of Sylvius or foramen of Magendi, or due to tumors in the posterior portion of the third ventricle, causes a bulging of the floor of the third ventricle in the region of the infundibular and optic recesses. The usual symptoms under such conditions are a bitemporal hemianopsia because of pressure on the optic chiasma, and choked discs as a result of the increased intracranial pressure. Not all cases, however, show papilledema, and the only ocular findings may be diminished visual acuity in one eye accompanied by an asymmetrical bitemporal hemianopsia. Asymmetric hemianopsia results from unilateral pressure on the chiasma with the result that both crossed and uncrossed fibers are affected on one side while only the crossing fibers are compressed on the other. This more frequently occurs when an obstruction of the aqueduct results from a shift of the ventricular system to one side, as occurs in many cerebral tumors. Unilateral loss of vision with optic atrophy, and slight choked disc on the opposite side were observed by the author in a girl with an ependymoma of the lateral and third ventricles (fig. 2).

Frontal-Lobe Tumors. Foster Kennedy³ was the first to emphasize the importance of unilateral loss of vision from "retrobulbar neuritis" in expanding lesions of the frontal lobe. These neoplasms were usually located in the lower portion of the frontal lobe and exerted pressure upon the optic nerve and chiasma. Foster Kennedy believes that a

central scotoma develops because the macular fibers are more delicate and of greater susceptibility to pressure. In our experience at the University Hospitals this syndrome has been infrequently seen, but incomplete homonymous hemianopsia, greater on one side than the other, has been of more common occurrence. This field change is the result usually of direct pressure upon the optic tract by the tumor mass. Occasionally indirect pressure on the tracts results from displacement of brain tissue by a tumor in the frontal or parietal lobes (fig. 3).

Hysteria. The ocular manifestations of hysteria are manifold, and visual disturbances may occur with or without other neurological evidence of the disease. Unilateral loss of vision is not an uncommon complaint. Complete or partial loss is usually sudden, and the patient can tell exactly when it occurred. The acuity of vision is usually constant, but variations may occur with different examiners and on different days. Perimetric fields show a concentric contraction that is as completely contracted for small targets as for large. A central scotoma, a peripheral contraction, or both may be elicited. Ophthalmoscopic examination reveals no evidence of ocular disease.

In hysteria, the signs and symptoms are usually consistent, since the patient is not aware of the functional nature of the disease. This is directly opposed to the situation in malingering, in which case the patient is cognizant of the absence of pathology. We must recognize on a clinical basis that there is often difficulty in clearly differentiating between malingering and hysteria, but fundamentally the two diseases are decidedly separate entities. The hysterical patient often responds to suggestion with resulting improvement in vision, and other signs and symptoms of hysteria can fre-

quently be elicited. The patient is usually but not invariably a young adult female, in whom a history of psychic trauma can be obtained. Frequently there is calm and unconcern rather than nervous overactivity and hyperexcitability. The diagnosis is usually not difficult if the patient is studied thoroughly.

Infrequent Causes. Infrequently a unilateral loss of vision may be due to the

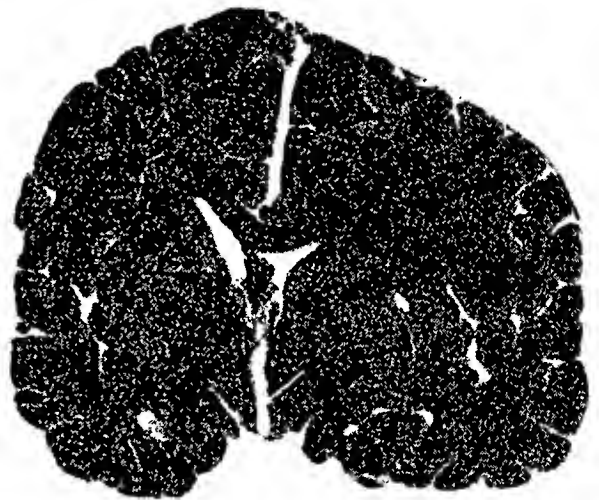


Fig. 3 (Leinfelder). Ventricular shift to left and internal hydrocephalus with well-dilated third ventricle. Tumor was on medial surface of frontal lobe.

early manifestations of neurosyphilis, neuromyelitis optica, optochiasmic arachnoiditis, or metastatic neoplasms. In chronic syphilitic meningitis, occasionally one may find a central scotoma as the early symptom of a beginning optic atrophy. A concentric peripheral contraction of the visual field may be the only accompanying sign, for in the early stage the nerve head may have a normal appearance. The presence of other signs and symptoms of syphilis of the central nervous system and the positive spinal-fluid reactions will lead to a correct diagnosis.

Most frequently optochiasmic arachnoiditis and neuromyelitis optica affect both eyes, but in either disease one eye

may remain normal for several days after the onset of symptoms. Neuromyelitis optica is characterized by a retrobulbar neuritis of acute onset with marked loss of vision, pain in the orbit, fever and malaise, and signs of disease of the spinal cord. The occurrence of peripheral signs of a myelitis in a case of retrobulbar neuritis is pathognomonic of neuromyelitis optica. In optochiasmic arachnoiditis, the diagnosis is more difficult. There is a gradually increasing loss of vision in which one eye may precede the other. A central scotoma on one or both sides with bitemporal field cut is a rather characteristic field change. Choked disc and optic atrophy may develop with one side being more marked than the other. The spinal fluid is usually normal, for the inflammatory process is well localized in the region of the chiasm. Positive diagnosis usually cannot be made except at operation.

Diagnosis of a lesion due to a metastasis of a malignancy depends to a great extent upon the recognition of the primary tumor. In addition to unilateral loss of vision, a neoplasm secondarily in-

volving the base of the brain can cause multiple signs and symptoms by pressure upon any of the cranial nerves.

CONCLUSIONS

Unilateral loss of vision should in each instance call to mind the possibility that the local condition is but a manifestation of disease of the central nervous system. In order to establish an etiologic diagnosis, it may be necessary to observe the patient repeatedly over a period of weeks. During this time, careful search should be made for new evidence of localization or extension of the process, by frequent thorough neurologic examinations, and by attempts to elicit variations and progressions in the visual fields. Special care should be observed to demonstrate early signs of compressions of the third, fourth, fifth, and sixth nerves, for involvement of these structures is extremely suggestive of a lesion at the base of the brain. Roentgenograms may serve to locate or identify the lesion, but occasionally a diagnosis cannot be made without exploratory operation of the base of the brain.

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ASTHENOPIA DUE TO VITAMIN-A DEFICIENCY*

FREDERICK C. CORDES, M.D. AND DAVID O. HARRINGTON, M.D.
San Francisco

The following report presents a clinical survey of cases of asthenopia in which the symptoms were apparently due to vitamin-A deficiency.

A great deal of work has been done on the vitamins during the last 10 years, and the literature contains many articles on the subject. Most of our knowledge has come from laboratory workers, and the clinician often has a hazy idea of the subject.

Yudkin¹ has defined vitamins as substances that are indispensable in the maintenance of the health and normal growth of all living cells. "The vitamins do not furnish energy, as do the proteins, fats, and carbohydrates, but they may be classified with the hormones and the inorganic elements such as iodine, copper, and manganese. These substances, according to some biochemists, may be looked on as stimulating or conditioning agents of cell metabolism, perhaps as a type of biochemical catalyzer."

As Mathews² points out, vitamin A was originally called fat-soluble A by McCollum, its discoverer, because it occurs in cream, the fat of milk, and in the oil from yolk of eggs. In this way he distinguished it from vitamin B which also occurred in milk and eggs but was water-soluble. This latter vitamin he designated as water-soluble B. These vitamins are now called simply A and B. In 1919 Steenbock³ noted some correlation between the vitamin-A effect of certain vegetables and the amount of the yellow pigment (carotene) present in these foods. Von

Euler⁴ in 1928 demonstrated that carotene could replace vitamin A in the diet. The name carotene has been applied to the four provitamins called alpha, beta, and gamma carotene and kryptoxanthin. All four are yellow pigments of plants. The body, however, cannot form vitamin A from the common yellow plant pigment xanthophyl. Vitamin A is colorless, has been isolated in almost pure form, but has never been synthesized. Carotene, as stated above, is intensely yellow.

SYMPTOMS AND SIGNS OF VITAMIN-A DEFICIENCY

A deficiency of vitamin A in the diet or interference with its absorption produces avitaminosis A. In this country the cases are usually very mild. There are certain symptoms and signs that are now associated with this deficiency: (1) night blindness (nyctalopia, or hemeralopia) and xerophthalmia, Bitot's spots, opaque whitish deposits in the scleral conjunctiva, are the most characteristic signs. (2) keratinization of epithelial cells in various parts of the body. (3) Cornification and eruption of the skin with papular and pustular lesions. (4) Retarded growth, weakness, and loss of weight. (5) Increased susceptibility to infections of mucous membranes. It is generally accepted that in adults and older children night blindness is almost always the earliest sign of the disease.

In this country the ocular manifestations of the deficiency are almost limited to this early stage.

A great deal of work has been done in relation to night blindness. One of the best articles on this subject is by Jeghers,⁵ who has made an excellent review of the entire subject of vitamin-A deficiency.

* From the Division of Ophthalmology, University of California Medical School. Read before the Eye, Ear, Nose, and Throat Section of the California Medical Association, Del Monte, May 1, 1939.

PHYSIOLOGY AND BIOCHEMISTRY OF VITAMIN-A

The vitamin-A content of our diet comes from two distinct sources: carotene from the plant kingdom, and true vitamin A from certain animal sources. The body is unable to synthesize either. Being fat-soluble substances, both carotene and vitamin A are absorbed by the lacteals of the intestine, become intimately associated with the chyle, and enter the general circulation through the thoracic duct, according to Drummond, Bell, and Palmer.⁶ No change takes place in either during the absorption process. Vitamin A is stored directly in the liver, while carotene, as demonstrated by Olcott and McCann,⁷ is converted into vitamin A before it is stored. Mendel⁸ showed that the liver plays an important part in the regulation of the concentration of vitamin A in the body. Certain physical conditions increase the need of vitamin A or retard its absorption or storage. These conditions have been summarized by Jeghers⁹: "Fever,⁹ rapid growth,¹⁰ general infection,¹¹ elevated basal metabolic rate,¹² and pregnancy,¹³ all increase the metabolic need for vitamin A. Lack of bile,¹⁴ or pancreatic secretion,¹⁵ changes in the gastrointestinal mucosa,¹⁶ and disturbances of motility of the gastrointestinal tract,¹¹ all prevent or hinder the proper absorption of this vitamin. Liver disease,¹¹ prevents the proper storage of vitamin A as well as the conversion of carotene to vitamin A." From this it is apparent that even with a so-called adequate diet there may still be a deficiency. It seems to matter little in the diet whether the vitamin is present in the form of vitamin A or carotene.

NATURAL SOURCES OF VITAMIN A

Booth and Hansen¹⁷ list the natural sources of vitamin A in the order of their potency.

Vitamin A. Halibut-liver oil is the richest source while burbot-liver oil ranks next followed by cod-liver oil and liver. Whole milk supplies more than any other single food, but large amounts are also found in butter, egg yolk, and animal fats (beef and mutton).

Provitamins. In this group apricots are the richest plant source while large amounts are also found in spinach, carrots, and chard. Smaller amounts (one sixth as much as in butter) are found in green beans, green peas, Brussels sprouts, lettuce, tomato, yellow squash, sweet potato, and pumpkin. Butter contains both vitamin A and carotene.

According to Sandler,¹⁸ storage, bleaching, oxidation, and some types of processing may reduce the vitamin content of the food. Most authorities, however, agree that very little vitamin A is lost during the processes of commercial canning or home cooking.

RELATION OF VITAMIN A TO THE RETINA

It has long been known that the rods in the retina contain a purple matter called visual purple or rhodopsin. It is very sensitive and becomes bleached and inactive when exposed to light. When the normal eye returns to darkness the visual purple is very rapidly regenerated. Loss of visual purple produces a loss of power of seeing faint sources of light.

The work of Friderica and Holm,¹⁹ Tansley,²⁰ Yudkin,²¹ and others demonstrated the presence of either vitamin A or carotene in the retina. Wald^{22, 23} was able to demonstrate that the substance was vitamin A rather than carotene and by his later work²⁴ was able to clarify the relationship between vitamin A and visual purple.

The consensus of opinion at present is that vitamin A is picked out of the blood by the retina, presumably first by the pigment layer and later by the rods and

combined with protein to produce the visual purple (rhodopsin). When exposed to light this changes into visual yellow and retinene. The visual yellow and perhaps the retinene change partly into vitamin A and partly into degradation products which pass out in the blood. The vitamin A is recombined with protein and the process is again repeated. During this cycle a certain amount of these substances is lost, necessitating a constant supply of vitamin A from the blood stream. The nature of the chemical changes is as yet undetermined. It is also, at present, not understood how the bleaching of the visual purple sets up an impulse in the optic nerve.

TESTS FOR VITAMIN-A DEFICIENCY

In 1934 Jeans and Zentmire²⁵ introduced the Birch-Hirschfeld photometer into this country as a means of measuring minor degrees of vitamin-A deficiency.

A few years ago an American firm perfected a new photometer called the "Bio-Photometer."* It operates on the principle of measuring the minimum light visible after the eye has been exposed to a bright light. The instrument has the advantage of measuring directly in millifoot-candles the minimal light intensity that is visible to the eye. There are also other methods of determining vitamin-A deficiency, but recently Jeans, Blanchard, and Zentmire²⁶ were able to show that the Bio-Photometer is more sensitive than other methods in picking out borderline cases of deficiency. In the cases reported here the Bio-Photometer was the instrument used to determine the presence of deficiency, and the normal curve determined by Jeghers was used as the standard.

* Manufactured by Frober-Faybor Company, Cleveland, Ohio.

ASTHENOPIA DUE TO EXCESSIVE LIGHT

It is well known that there are patients who appear to be on a normal vitamin-A diet but who, as the result of working under excessive light or conditions of glare, have asthenopia. The usual symptoms are photophobia, pain, and fatigue of the eyes upon use, headache and momentary attacks of blurring of vision toward the end of the day. When the patients are away from their work for a few days the symptoms disappear. The Bio-Photometer test usually shows a low reading, and the patients are helped by increasing their vitamin-A intake.

Typical of this type were: an artist whose models sat under a strong light; a service station attendant in one of the warm valley towns, whose station was surrounded on three sides by white walled buildings; and an artist who painted the film of animated cartoons, the work being done over a very bright light box.

The work of another patient, assistant curator in a museum, consisted of repairing paintings, restoration work of various types, together with a good deal of work on white. His rooms had very light-colored walls and were directly under a large skylight, so that a great deal of light was present. The patient complained of headache upon use of the eyes, pain, vision "coming and going" after three o'clock in the afternoon, inability to do any work at night, and, upon questioning, gave the symptoms of night blindness. Prescription of glasses and treatment of a low-grade chronic catarrhal conjunctivitis gave some relief. The remainder of the ocular examination and general physical examination was negative. A Bio-Photometer test was not available, but because of the symptoms of night blindness the patient was given 30,000 units of carotene daily. At the end of two weeks the symptoms of asthenopia

had disappeared, although he still had some symptoms of night blindness. He was soon able to use his eyes all day without symptoms and for the first time in a number of years was able to work at night.

This case suggested the possibility of certain cases of persistent asthenopia being associated with insufficient vitamin A in the diet. When the Bio-Photometer test became available it was decided to study a series of these cases to determine whether or not asthenopia at times is related to vitamin-A deficiency.

ASTHENOPIA IN VITAMIN-A DEFICIENCY

This clinical report is based on the study of 82 private patients with persistent asthenopia in whom, as indicated by the Bio-Photometer, there was a deficiency in vitamin A. Therapy was instituted only after sufficient time had elapsed to have obtained all possible relief from the correction of the usual causes of asthenopia. In some of the later cases the symptoms were so suggestive of vitamin-A deficiency that the Bio-Photometer reading was taken at the time of the initial examination; in the majority, however, it was obtained when the patient returned, after a month or longer, complaining of persisting symptoms.

Sex and Age. There was a marked predominance of females in this series of cases, only 29 percent being males. The age group was between 13 and 78 years, with the average age at 45.85 years. It is interesting to note that 51 percent of the patients were in the presbyopic age.

Symptoms. As Jeghers²⁷ has pointed out photophobia and sensitivity to glaring lights frequently accompany avitaminosis A, so that it is not surprising that 69 percent of the patients complained of being light sensitive.

Aside from this photophobia there

were certain other symptoms which disappeared with therapy that were found so consistently among these patients as to suggest a fairly typical symptom complex. The eyes ached after use for a short time; while reading the print blurred momentarily ("comes and goes") and there was difficulty in reading over 10-15 minutes at a time, especially at night. These were the symptoms met with most frequently. In 16 percent of the patients there were indefinite symptoms such as being conscious of the eyes and uncomfortable when using them. Eleven percent complained of headache or blurring while driving, and in approximately the same number there was difficulty when viewing the movies. Seven cases had marked symptoms of asthenopia to the extent that they were unable to use their eyes. As we shall see later, it is this group that primarily accounts for the failures in treatment. In a few instances headache upon use of the eyes was the principle complaint.

TABLE 1

SUMMARY OF SYMPTOMS DUE TO AVITAMINOSIS A
(Persisting after correction of usual causes)

Photophobia	69%
Eyes ache after use for short time	48%
Difficulty in reading over 15 minutes, especially at night	37%
Momentary blurring while reading	31%
Indefinite symptoms of asthenopia	16%
Headache or blurring of vision while driving	11%
Symptoms while attending movies	10%
Marked symptoms of asthenopia	7%
Dizziness	1 case
After image	1 case
Persistent chronic conjunctivitis present	26%

One patient of 23 years (Case 62) had among other symptoms a persistent dizziness which disappeared under treatment only to reappear after carotene had been discontinued for a time. With subsequent return to therapy it again disappeared.

A young man of 34 years (Case 11) had a bluish afterimage that was persistent but disappeared under treatment.

Four patients (cases 30, 39, 59, and 80), all of whom were completely relieved of their symptoms, had had difficulty "for years" and had been to many oculists.

It is interesting to note that 22 patients (26 percent) had a chronic persistent conjunctivitis.

Bio-Photometer readings. The low point of the Bio-Photometer readings, taken before therapy was instituted, ranged between 0.7 and 4.2 millifoot-candles, the average being 2.09 mft-c. Accepting Jegher's normal of 0.75 mft-c, the average of 2.09 can be considered very low.

After treatment and before discharge the average reading had been brought up to 0.9 mft-c. There were some patients whose symptoms disappeared and in whom the Bio-Photometer reading improved but never approached normal. In other instances, to be discussed later, it was necessary to maintain the level above "normal" to relieve symptoms (Chart 1).

Night blindness. In only 22 percent of the cases was it possible to obtain a history of any degree of night blindness. This was surprising in view of the fact that the average Bio-Photometer reading for the group was 2.09 mft-c, and would seem to indicate that many individuals have a mild degree of night blindness of which they are unaware. This agrees with the opinion of a number of writers^{5, 16, 26} that milder degrees of avitaminosis A are more prevalent than has been suspected.

The relation of vitamin-A deficiency to difficulty of driving an automobile at night was illustrated by three rather unusual cases. Case number 66 was of a male of 46 years who had a Bio-Photometer reading of 4.2 mft-c. This caused such a marked night blindness that he had given up driving his car at night.

The second patient (case 65) a male of 38 years, whose Bio-Photometer reading was only down to 1.9 mft-c, had marked difficulty driving at night, while the third patient (case 50), whose reading was 1.75 mft-c, experienced similar difficulties. That the first case should have marked symptoms is readily understood because of the extremely low reading but it was somewhat surprising that the last two individuals with rather mild avitaminosis A should complain so severely of trouble in night driving. In all three instances the symptoms disappeared under treatment.

Diet and Physical abnormalities. In this series 31 percent gave a history of dietary deficiency. Thirteen of these patients had chronic gastrointestinal disease, in most instances chronic colitis, and were on so-called bland or smooth diets. In four instances there was chronic gall-bladder disease with its dietary regulations. One patient was allergic to many foods, couldn't drink milk, was "horri-fied" at the thought of vegetables, and as a result was on a markedly deficient diet. Her physician stated that he "doesn't see why she doesn't have scurvy." A woman whose husband, a ship's radio operator, was gone for long periods of time showed a marked avitaminosis A. During her husband's absence the patient, who lived alone in a small apartment and didn't want to cook for only herself, lived upon poorly selected canned foods. In several instances the deficiency was the result of a poorly planned reducing diet. Two patients, who gave a history of excessive alcohol over a long period of time, had very low Bio-Photometer readings. In these cases the hypovitaminosis B associated with alcoholism and characterized by loss of appetite may have been indirectly responsible for the vitamin-A deficiency by causing a restricted intake of food. In addition it is recognized that

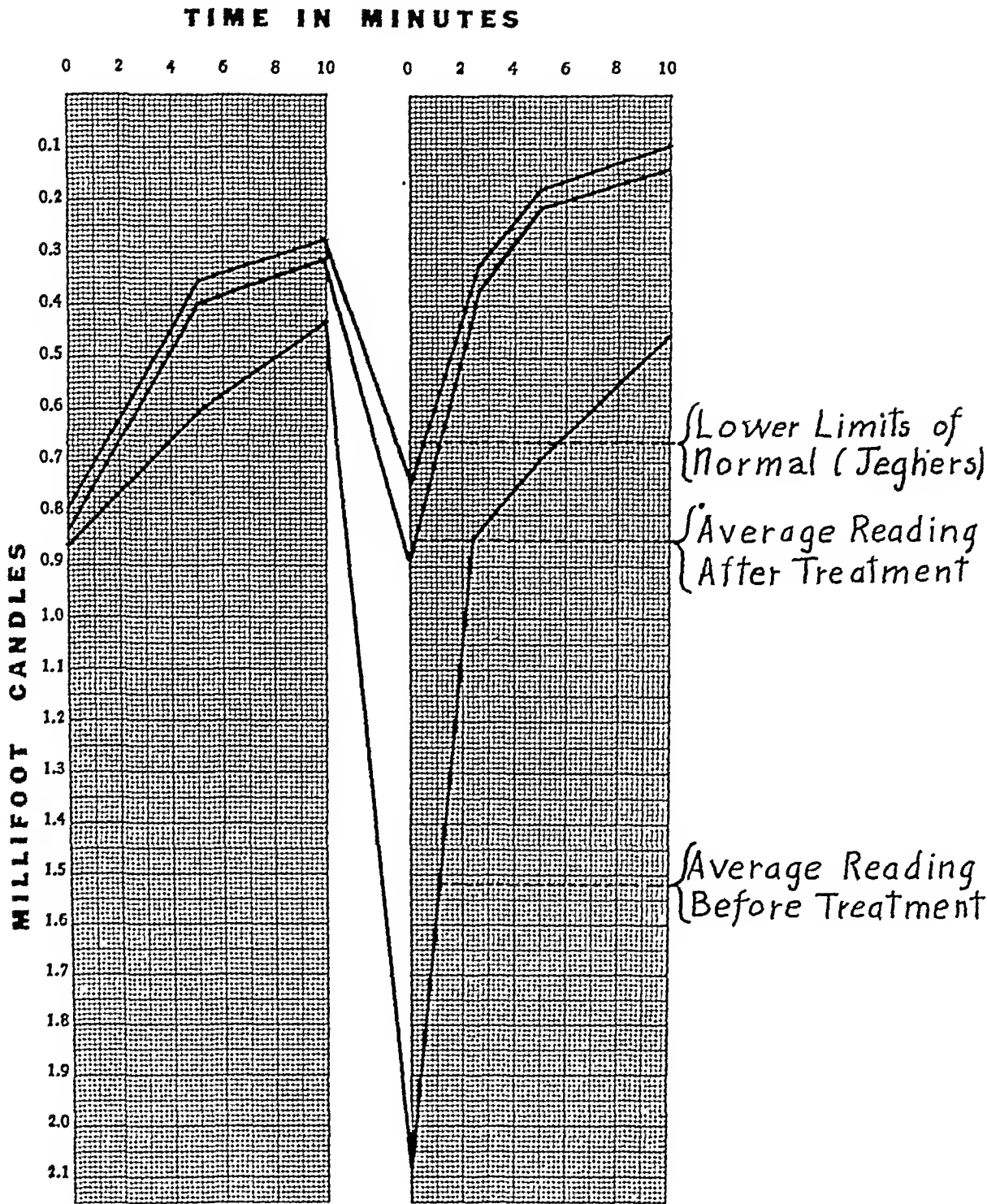


Chart 1 (Cordes and Harrington). Average Bio-Photometer readings in vitamin-deficiency cases.

prolonged deficiency in any one vitamin may bring about a shortage of others.

Other physical conditions which may have had a bearing were a longstanding chronic sinus disease, chronic arthritis, and chronic bronchitis. Two patients

were in the menopause, from which they were receiving rather marked disturbances that probably accounted for their abnormal diet.

Aside from the 31 percent noted above, the remainder of the patients seemed to

be on an adequate diet. Several patients lived in areas where there is a good deal of glare and heat in the summer and this must be considered as a possible factor in the avitaminosis A.

Refractive errors. The type of refractive error has no apparent relationship to vitamin-A deficiency. In this group 66 percent were hyperopic and of these the majority had compound hyperopic astigmatism. As already stated, over half of the patients were in the presbyopic age.

Therapy. Coward²⁸ found no significant difference between the efficiency of absorption by the rat of vitamin A of cod-liver oil, the vitamin A and carotene of butter, and the vitamin A artificially added to margarine. Wilson, Das Gupta, and Ahmad²⁹ showed that carotene of green vegetables is well absorbed by man, especially when fats are present. From this it is apparent that there is no essential difference whether vitamin A or carotene is used.

In this study S.M.A. carotene in oil capsules, which were graciously furnished by the manufacturer, were used. These capsules are standardized in U.S.P. units of vitamin A. This unit consists of the amount of vitamin A in milligrams producing the growth promoting and antixerophthalmic activities in vitamin-A depleted rats equal to that of 0.6 gamma of International Standard beta carotene. If other forms of vitamin A are used they should be in the form of concentrates such as Super-vitamin-A concentrate (Upjohn) in which each capsule contains 8,500 U.S.P. units of natural vitamin A, together with approximately 100 units of vitamin D dissolved in a vegetable oil. Using cod-liver oil as a source it would require about 15 teaspoons a day to equal 30,000 units of vitamin A. In addition to obvious objec-

tions there might be some possibility of hypervitaminosis D with its resultant increased calcification of tissues, particularly the cardio-vascular system.

In the majority of cases 30,000 units (one 10,000 unit capsule t.i.d.) were given daily for a period of one month and then the Bio-Photometer reading was repeated. With this and the subjective symptoms as a guide the carotene was continued or reduced in amount until an apparent balance was obtained. With complete disappearance of symptoms some patients did not return for further observation. There were two patients who were unable to take carotene because of the resultant gastric distress. It is interesting that in the majority of cases some improvement of the symptoms was noted within a week or 10 days from the time therapy was started.

A word of caution concerning excessive use of carotene: If it is absorbed faster from the intestinal tract than the liver can convert and store it, this surplus causes a yellow color (carotinemia) to appear in the body. It is not dangerous and disappears promptly when the carotene intake is reduced. In case 39 a definite carotinemia developed which disappeared promptly when the amount of carotene was reduced, while in case 72 there was a definite slight yellow discoloration of the hands.

Results. In this series 79 percent of the patients had complete relief from their symptoms following carotene therapy, 12 percent received partial relief, while in 9 percent there was no improvement.

The following two histories illustrate the average typical case that was improved by therapy.

Case 40. Mrs. A. B., aged 63 years, had persistent symptoms of photophobia, fatigue of eyes, and headache when doing near work and was generally unhappy

regarding her eyes. Conjunctivitis had been persistent and resistant to treatment. Her general physical condition was good and her diet seemed adequate. The Bio-Photometer reading was 2.2 mft-c. On August 6, 1937, the patient was given 30,000 units of carotene daily. At the end of one month she was entirely comfortable, was able to read, and no longer had headache. Her conjunctivitis had almost disappeared. The Bio-Photometer reading was 0.7 mft-c. The patient has remained comfortable up to the present time (20 months) by continuing 10,000 units of carotene daily.

Case 59. Mrs. C. C., aged 66 years, had been a patient for a number of years and during this time had had persistent photophobia and mild chronic catarrhal conjunctivitis. She had had trouble reading at night for a period of many years and at times while reading, she said, the vision "comes and goes." Movies had always bothered her. The patient had a history of long-standing chronic colitis, but appeared to be on an adequate diet. The Bio-Photometer reading was 1.3 mft-c. The patient was put on 30,000 units of carotene daily. At the end of a week there was a definite improvement, and at the end of a month she stated that she was perfectly comfortable and that her eyes were the best they had been in a long time. The Bio-Photometer reading was 0.65 mft-c. After two months the patient discontinued carotene with a subsequent drop of her reading to 1.1 mft-c. With this her symptoms returned in a mild form but disappeared when she was again given carotene. This patient has been kept under observation for 18 months and has been kept comfortable by the continued use of 10,000 units daily.

In some instances the results were spectacular, as illustrated by Case 74.

Mrs. C. J. B., aged 58 years, was first seen in 1936, complaining of photophobia, marked fatigue, and aching of the eyes after close work together with symptoms after driving or going to the movies. In addition to her refractive error there was a rather marked chronic catarrhal conjunctivitis. After refraction and treatment of the lids the patient obtained only partial relief. She was not seen again until August, 1938. In the meantime she had been to several ophthalmologists who had changed her glasses and given her lid treatments but without improvement in her condition. The complaints were essentially those of her 1936 visit, and the conjunctivitis was still present. The patient's general physical condition was apparently excellent and she seemed on an adequate diet. The Bio-Photometer reading was 2.2 mft-c. The patient was given 30,000 units of carotene daily. A month later she stated that she was completely well, was able to read as much as she pleased, could go to the movies without symptoms; driving no longer bothered her and she was very happy to be able to do as she wanted without thinking of her eyes. The patient has continued to be free from symptoms on 10,000 units daily. The persistent conjunctivitis has entirely disappeared.

In the group that obtained partial relief there was in each case some chronic physical condition that was undoubtedly a factor. Illustrative of this group is

Case 39. Miss M. B., aged 39 years, a teacher, gave a long history of eye trouble including photophobia, blurring of vision, headache, difficulty in reading at night, and a persistent conjunctivitis. She had a great deal of stomach trouble for which she was on a diet that included very few vegetables, little milk or cream. The Bio-Photometer reading was

down to 2.15 mft-c. The patient was given carotene therapy (30,000 units daily); under this the photophobia and blurring of vision disappeared and there was some improvement in her conjunctivitis. The headache and difficulty of reading at night, however, persisted. Because of the tendency to develop carotinemia the amount of carotene had to be reduced and because of her stomach condition it was not possible to give her sufficient vitamin A to bring the reading over 1.9 mft-c.

A review of the failures is not without interest. In this group, the patients in cases 4 and 28 had typical symptoms, low readings, and no apparent physical or mental abnormalities. Treatment which improved their Bio-Photometer readings to normal failed to give any relief from symptoms.

Three of the patients (cases 16, 22, 64) were single women in their fifties who had had marked symptoms of asthenopia and photophobia for years. In all of them there was a history of indefinite physical complaints for which their physicians could find no cause. The Bio-Photometer readings were very low in all three and under treatment showed marked improvement (to normal in case 16) but without any relief from their symptoms. Two of them were convinced that nothing could help them. It seems fair to assume in these cases that the vitamin-A deficiency was only a small factor in the general picture.

In case 10, the patient, a woman of 59 years, had marked symptoms associated with the menopause. Even though therapy improved her Bio-Photometer reading from 2.5 to 0.7 mft-c, there was no improvement in symptoms except for some relief from her photophobia.

Of particular interest was the patient in case 20, a woman of 80 years, who

had the typical symptoms of asthenopia associated with vitamin-A deficiency. She was in poor physical condition, being very anemic, and had a history of chronic gastrointestinal disease over a period of many years. Treatment for a period of seven months gave no relief. Her first Bio-Photometer reading was 3.2 mft-c, and even on 40,000 units of carotene daily was brought above 2.5 on only one occasion. During the short time she was up to 1.9 mft-c, there was a slight improvement in her symptoms. In view of the gastrointestinal history, this patient seems to illustrate the type of avitaminosis A in which changes in the gastrointestinal mucosa or disturbances of motility of the gastrointestinal tract prevent or hinder the proper absorption of this vitamin.

Comments. Aside from improvement of the asthenopic symptoms under carotene therapy certain observations were made that warrant further comment.

In the patients under treatment 46 percent had complete relief from their symptoms even though the Bio-Photometer reading was still below normal. On the other hand there were a number of patients with normal Bio-Photometer readings whose symptoms were typical of vitamin-A deficiency. As a result, these patients were put on carotene therapy with ultimate relief and with a reading above normal. In case 52, which is typical of this group, the reading was 0.7 mft-c, and the patient was free from symptoms when under carotene. The reading increased to 0.25 mft-c. When carotene was discontinued the Bio-Photometer value dropped to the so-called normal, with a return of the symptoms which again disappeared when therapy was resumed.

In about 50 percent of the patients it

was necessary to continue carotene even though the patients were instructed to increase the vitamin-A content of their diet, as the symptoms returned when the carotene was discontinued, and the Bio-Photometer readings dropped. Recently cases have been kept under observation until the amount of carotene necessary to maintain a balance has been determined. In most instances 10,000 units daily was sufficient to accomplish this.

The relation of avitaminosis A to certain conditions of the skin and mucous membranes is well recognized and was illustrated in several instances in this series.

L. K. (case 24), a girl of 13 years, on a reducing diet, had in addition to her asthenopic symptoms, a marked acne that had been most resistant to treatment. After she had been on carotene for two months the skin condition had entirely cleared. W. C. (case 61), a male of 32 years, had a marked eczema of the hands which had been under treatment for a number of years but without improvement. His Bio-Photometer reading was very low (3.5 mft-c) so that he was put on 40,000 units of carotene daily. At the end of a month the eye symptoms had disappeared, the chronic skin condition was cleared, and the patient volunteered that his hair had stopped falling out and was no longer as dry as it had been.

Three patients (cases 39, 81, 82) stated that there was a marked improvement in their chronic nasal condition. One volunteered that the "right side of the nose is clear and open for the first time in 10 to 12 years."

In two instances (cases 68, 80) the therapy apparently was of marked benefit to the gums. One of the patients stated that the gums had stopped bleeding and were not spongy for the first time in years. After she had been on treatment for two months she saw her dentist who

commented on the improved condition of her gums and asked what had been done to produce such a marked improvement.

In 22 cases there was a persistent chronic catarrhal conjunctivitis that in 18 disappeared spontaneously when the patients were given carotene. It was rather noteworthy that in a high percentage of cases with very low Bio-Photometer readings a chronic conjunctivitis was present.

Case 15 is of interest because of the fact that the symptoms were controlled for 14 months by the daily use of 10,000 units of carotene. At the end of this time the patient went into the menopause and with this her symptoms returned but again disappeared when the daily intake was increased to 20,000 units of carotene.

A detailed discussion of case 26 is warranted because of several unusual features. Mr. F. H. E., aged 71 years, had a chronic simple glaucoma that was controlled by miotics for a number of years, but in 1928 the excitement of having his home burglarized precipitated a sharp increase in tension that required surgery. While in the hospital he developed a bilateral acute glaucoma for which his ophthalmologist performed a bilateral iridectomy. This procedure has controlled the tension since that time. The field of vision was markedly contracted in one eye and concentrically contracted in the other. In April, 1938, the patient complained of rather marked night blindness and that the eyes ached upon use and fatigued easily and that he could read only a very short time at night when the print blurred. He had a very troublesome photophobia, especially on looking out of a train window, and was unable to ride in a car at night because of the great discomfort. The Bio-Photometer reading was 2.3 mft-c. The patient was put on 60,000 units of carotene daily. At the end of 11 days there was an im-

provement in symptoms and the reading had improved to 1.4 mft-c. The condition gradually improved until a normal Bio-Photometer reading was obtained and held by 20,000 units daily. The patient's symptoms have entirely disappeared, and one year after treatment was started he continues to be comfortable. This case is particularly noteworthy as, with a history of glaucoma, contracted fields, and bilateral iridectomy one would expect at least some of the symptoms complained of, and yet they were so typical of avitaminosis A that we had a Bio-Photometer test made. The result suggests that possibly some of the symptoms complained of after glaucoma surgery, particularly iridectomy, may at least in part be due to lack of vitamin A.

Carotene was tried in one case of bilateral chronic simple glaucoma with some contraction of fields in which the tension was controlled by miotics. The patient complained of night blindness and, as was to be expected with small, contracted pupils, received no relief from the use of carotene.

SUMMARY

This report presents a review of 82 cases of persistent asthenopia in which it is felt vitamin-A deficiency, as judged by the Bio-Photometer, was the causative factor. The Bio-Photometer readings varied between 0.7 and 4.2 mft-c, the average being 2.09. In this group a history of night blindness was obtainable in only 22 percent of the cases. In 30.5 percent there was an apparent deficiency in diet, while 17 percent of the patients gave a history of chronic gastrointestinal disease, usually chronic colitis.

These patients were treated with carotene in oil, the average dose being 30,000 units daily. Of the patients on this therapy 79 percent obtained complete

and 12 percent partial relief from their symptoms. In the majority of patients it was necessary to continue small doses of carotene to maintain a balance. Forty percent of the cases were observed for a period of over six months and 20 percent between one and two years.

The symptoms that persisted after the usual causes of asthenopia had been corrected were consistent enough to suggest the following symptom complex as being typical of vitamin-A deficiency:

The patients complained of photophobia associated with pain and rapid fatigue of the eyes upon use, especially at night; difficulty in reading for longer than 15 to 20 minutes, with the print at times blurring momentarily. Driving and the movies caused headache and blurring in a fairly high percentage. A chronic persistent conjunctivitis was a rather frequent finding. Often these symptoms were associated with a deficiency in diet or gastrointestinal disease, especially chronic colitis.

In the series reported here, carotene in oil was the source of vitamin A. From the literature, however, it appears that there is little difference whether vitamin A units are taken as cod-liver oil, vitamin-A concentrates, or carotene.

If, as noted above, any disturbance is present which increases the metabolic need for vitamin A or hinders its absorption or storage, larger than normal amounts of vitamin A are necessary. This explains the reason for the necessity of the continued use of carotene in some instances even though the diet was corrected.

It is hoped that this preliminary report may stimulate others to further study the clinical effect of vitamin-A deficiency on the normal functions of the eye.

384 Post Street.

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DERMOID (OIL) CYST OF THE ORBIT*

REPORT OF A CASE

W. E. BORLEY, M.D.

San Francisco

Reports of dermoid cysts of the orbit are to be found infrequently in the literature in recent years, and these tumors are considered by some to be of rare occurrence. Samuels¹ reported on his examinations of dermoid cysts under the microscope, the majority of which showed no unusual features. He considered one of these cases, however, to be an oil cyst of the orbit of dermoid type in which the oil had ruptured through the cystic wall and spread into the subcutaneous tissues back of the fibers of the orbicularis muscle. He believed that dermoid cysts of the orbit were of the rarest occurrence, being more uncommon than intraocular retinoblastoma or sarcoma. He stated that in the literature of the pathological anatomy of the orbit he had been unable to find any description of a spontaneous extrusion of oil from a dermoid cyst of the orbit, although such a condition had been reported by Maresch² in dermoid cysts of the ovary and in one of the testis.

Jones³ reported the case of an oil cyst of the orbit with malignant degeneration and the formation of a squamous-cell carcinoma. He reviewed the literature quite thoroughly and stated that Berlin in 1880 had collected 73 cases of orbital tumors, all but 23 of which were undoubtedly dermoid cysts. Cornwell⁴ in 1882 reported the case of an oil cyst of the orbit which began in childhood and in which the eye was finally enucleated

for removal of the entire cyst. Jones further cited a case reported by Hirschberg⁵ in 1879 of a dermoid tumor in an adult which had been noted in early childhood. In 1932 Rasquin⁶ reported on an oil cyst in a child six years old. The tumor was divided into two parts, one containing a yellowish liquid of oily appearance, the other a sebaceous material. Knapp⁷ reported an oil cyst of the orbit in 1923, in a woman 27 years of age, and gave the results of a chemical examination of the content of this cyst. It was found that the oil contained no free fatty acid, but 36.2 percent cholesterol and had an iodine number of 124, indicating that it consisted mostly of triglyceride of a fatty acid. The solid portion of the cyst contained 72 percent of cholesterol. Knapp believed that the proportion of the oil depended on the relative number of sebaceous glands present and that in these oil cysts the oil is a direct product of the sebaceous gland. Harold Gifford⁸ in 1923 reported five cases of dermoid tumors and two of oil cysts of the orbit treated with pure liquefied trichloroacetic acid. In 1929⁹ he again reported a case of a recurrent dermoid cyst of the orbit operated on unsuccessfully three times, finally completely cured by treating it with pure liquefied trichloroacetic acid. Palomar Collado,¹⁰ cited by Samuels, described a dermoid cyst of the orbit that formed a narrow duct and extended through a tiny channel in the external bony wall, to a knapsack-shaped diverticulum under the temporal muscle. An excellent review of the pathology of these dermoid cysts is given in the report by Samuels.

* From the Division of Ophthalmology, Department of Surgery, Stanford University School of Medicine, San Francisco, California. Read before the Western Ophthalmological Society at Portland, Oregon, April, 1939.

In the following case there were several unusual diagnostic and pathologic features. These not only show the bizarre fashion in which some of these tumors present themselves, but they may be of some value in the differential diagnosis of orbital neoplasm.

REPORT OF CASE

T. M., a male of 27 years, a senior medical student, was first seen on December



Fig. 1 (Borley). Retraction of left lower lid.

1, 1937, when he complained of lacrimation in the left eye that had been present since childhood. He had noted since 1922 that the left palpebral fissure was wider than the right. There were occasional strings of mucus which he could wipe away from his left eye, and sometimes a fairly thick oily secretion. A number of examinations had failed to reveal the cause of the epiphora, although the tear duct had been irrigated numerous times. His mother furnished the information that at one year of age there was a swelling below the left eye which was incised. This swelling recurred several times but apparently subsided with application of hot compresses until at the age of 12 it was again incised.

On examination visual acuity of each eye was 20/20. The patient was wearing a small compound hyperopic astigmatic correction. Muscle balance showed 0.5^A right hyperphoria for distance, 6^A exophoria for near. The left eye showed a wider palpebral fissure than did the right,

due to a slight retraction of the lower lid (fig. 1). Exophthalmometer measurements were right 18.5 mm., left 18.5 mm. Extraocular movements appeared to be normal. On everting the left lower lid to expose the cul-de-sac there was found an atrophic conjunctiva in the medial portion of the cul-de-sac with considerable underlying scar tissue. A fistulous tract in the cul-de-sac in the middle of this scar tissue was found, on probing, to extend into the orbit in a posterior and lateral direction, a distance of 2 to 3 cm. (fig. 2). Upon pressure on the lower lid an oily secretion exuded from the opening of the fistula. The tear sac drained freely.

Laboratory examination: A blood count was made, and there were found to be leucocytes 6,000; neutrophils 48 percent, of which 6 percent were banded, 42 percent segmented, 2 percent basophiles, 41 percent lymphocytes, and 9 percent monocytes.



Fig. 2 (Borley). Fistulous opening in cul-de-sac.

The report of the radiology department on November 10, 1937, was as follows: "A small smooth oval object in the floor of the left orbit shows no connection with the bone. It might be a calcified abscess or cyst, or a foreign body" (fig. 3). On December 2d, another X-ray examination was made following lipiodol in-

jection of the fistulous opening in the cul-de-sac, and the report was as follows: "The lipiodol collects in a small cavity which projects to each side and behind the calcified body" (fig. 4). The pre-operative diagnosis was cyst of the orbit, probably dermoid with some calcified material.

On December 15, 1937, an operation was performed for removal of the cyst by Dr. Emile Holman, using local anesthesia. The skin incision was just above the lower orbital rim and extended almost the entire extent from inner canthus to outer canthus. This was carried through

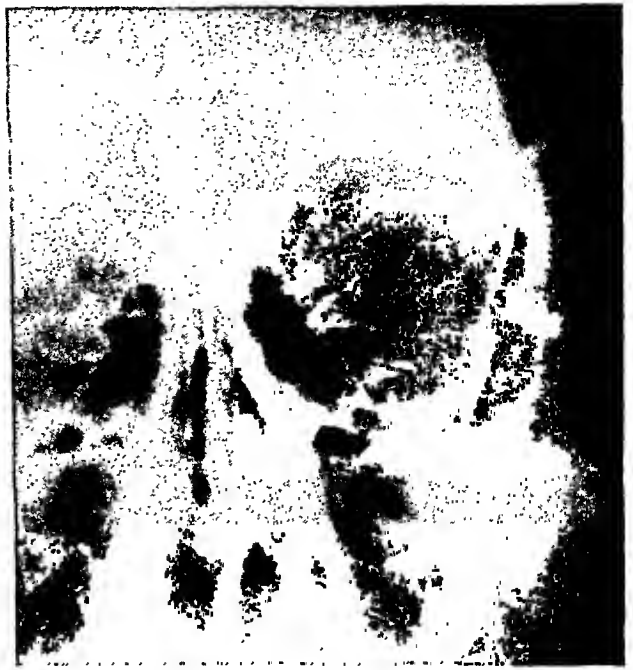


Fig. 4 (Borley). Roentgen appearance after injection with lipiodol.

which penetrated into the sac and made identification of the entire tumor quite simple. The collapsed sac was opened anteriorly and the tooth exposed. The fistulous tract was cut away from its opening into the conjunctiva and dissected with the tumor posteriorly, where a few fibrous adhesions at the apex of the orbit were cut loose from the tumor itself. The opening in the cul-de-sac healed satisfactorily without drainage, and there were no postoperative complications (fig. 5).



Fig. 3 (Borley). Roentgenogram of left orbit showing calcification.

the orbital septum and the tumor exposed beneath the eye where it presented itself at the lower orbital rim. It was found to extend laterally almost to the lateral orbital wall and posteriorly toward the apex of the orbit between 3 and 4 cm. The sac of the cyst was found to lie outside of Tenon's capsule, and there was no involvement of the inferior rectus muscle. The inferior oblique muscle was found to lie above the sac wall and was not connected with it. The fistulous opening was injected with methylene blue,

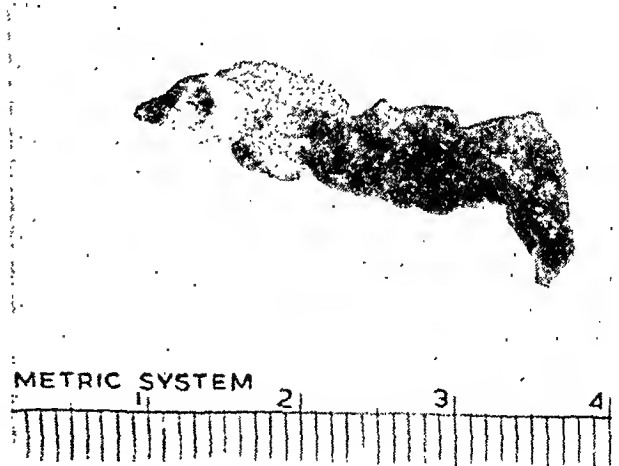


Fig. 5 (Borley). Gross specimen of tumor showing tooth.

Examination on March 25, 1939, showed the fistulous opening to be healed. There was no evidence of recurrence although the retraction of the lower lid was still present to a slight degree. Exophthalmometer readings at that time were right eye 18 mm., left eye 18 mm. There was no complaint of epiphora.

The pathological report is as follows: "The gross specimen consisted of a piece of soft tissue, 2 cm. by 6 mm. in size, with a tooth 7 mm. in length by 3 mm. by 2 mm. at one end. Microscopical examination: Sections show a small tooth with dense fibrous-tissue attachments, adjacent to which are a moderate number of sebaceous glands, sweat glands, and occasional hair follicles. No epithelial lining can be made out. The diagnosis is dermoid cyst of the orbit, benign."

DISCUSSION

According to Ida Mann¹¹ congenital tumors of the orbit, of which dermoids are examples, fall embryologically into three classifications: First there are the tumors composed of only one germ layer; such as the osteomata, angiomata, or nevae. Second, there are the tumors composed of structures from both mesoderm and ectoderm, of which dermoids are good examples, the latter having both mesoblastic and epiblastic elements. In the last group are included those tumors composed of elements of all three germ layers of which there are only the true teratomata. These are exceedingly rare in the orbit and are usually malignant.

This case shows several clinical and pathological changes characteristic of the second group of tumors, no matter where they may be found in the body. Its appearance early in life with probably incision and drainage and then again its development and progress about puberty with possibly again another drainage, and finally the formation of the fistulous tract

are points of interest in the history; whether it actually ruptured spontaneously and formed a fistulous opening in the cul-de-sac or whether this was the result of an incision is not definitely known. The excessive tearing and secretion in recent years in this case was undoubtedly due not only to the secretion of oily material from the cyst itself but to a secondary irritating effect of this oil. From the standpoint of diagnosis this case shows the value of an X-ray examination with demonstration of a calcified body in the orbit and the possibilities of outlining such foreign bodies and cavities with lipiodol.

In general the history of this type of case is fairly characteristic. There is noted early in life a swelling at some point under the lids, usually in the superior temporal quadrant. These swellings may disappear or at least not progress to any extent until puberty when they usually begin to grow and cause irritating symptoms and in some instances fairly marked proptosis. In almost all of the reported cases some therapeutic procedure was found necessary before the age of 30 years. In the case reported by Jones, although the tumor had been noted 10 years previous to operation, the patient was 53 years old at the time of removal. In this case the increased size of the tumor was due to a malignancy developing within its walls and with this case in mind it would seem advisable to remove these tumors or at least to destroy the lining of the wall before the patient reaches what is usually considered the cancer age. Pathologically this case should be classed as a dermoid cyst, for it contains only epiblastic or mesoblastic tissue. This is true also of the cases reported by Samuels. The essential histological characteristics of these tumors consist of an inner lining of epithelium with occasional long or short hairs and

hair follicles, at a somewhat greater depth within the wall sebaceous glands in varying numbers and still deeper occasional sweat glands. Each case, however, may show individual variations and this is well brought out by Samuels. In some of his cases the epithelial lining had disappeared, being replaced by a layer of granulation tissue. He felt this probably depended upon the increased intracystic pressure, which caused the epithelium to become atrophic. In other cases both epithelium and sebaceous glands had disappeared, and the occasional sweat glands had also disappeared due to long-continued intracystic pressure with gradual thinning of the cyst wall. As mentioned previously the few cases showing oil in any large amount were undoubtedly of the type that contained many sebaceous glands.

The treatment of these cysts must be varied depending on their size and location. Gifford stated that practically all the old texts mention excision as the only therapeutic measure. Occasionally, treatment of the cyst wall by tincture of iodine, nitrate of silver, or iodine and 10-percent carbolic acid is mentioned. Gifford believed that his treatment with pure

trichloroacetic acid after curetting the wall afforded a very satisfactory means of cure, and he used it in seven or eight cases with success. He believed that it is of particular value where there are diverticula of the main body of the cyst and where excision may be very difficult. Knapp in his case used a surgical excision employing the Krönlein procedure, and it can be understood why this may become necessary in some cases with large cysts with diverticula extending throughout the orbit. Simple excision would seem to be the method of choice in small well-localized tumors and of necessity is the only method available in cysts including teeth, or in those with fistulous tracts.

SUMMARY AND CONCLUSION

1. A case of orbital dermoid or oil cyst is reported.
2. The unusual features of this case are the presence of a fistulous tract opening into the cul-de-sac and the finding of a tooth in the cyst cavity.
3. The diagnostic value of the roentgen examination with lipiodol is pointed out.
4. An enumeration and evaluation of the therapeutic measures employed in these cases is given.

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NEUROMYELITIS OPTICA*

REPORT OF A CASE

A. G. ATHENS, M.D.

Duluth, Minnesota

This case is reported both because of its comparative rarity, and because of the widespread involvement of the central nervous system with alarming symptoms, from which there has been almost complete recovery.

The patient, a white male, aged 15 years, was referred to me by his family physician on February 22, 1938, complaining that he could not see. About February 8th his vision began to blur while he was in school and within two days it was so poor that he was unable to read at all. He had had frequent frontal and occipital headaches and pains in the eyes on looking up and to the right during this period. He had vomited once four days previously. His appetite was poor.

In early January he had had a mild attack of mumps. Within a week he was normal again. One year before he had had a light attack of scarlet fever. Tonsils and adenoids had been removed when he was five or six years of age.

The patient was an illegitimate child. His home life was not pleasant. His stepfather and mother disagreed as to his discipline and he was considered a "problem child." Nevertheless he progressed well in school and had an intelligence quotient of 87. When away from home at summer camp he seemed quite normal.

On examination, the pupils were found to be equal, 6 mm. in diameter, and reacted to light and convergence. The media were clear. The discs showed a

slight pallor of the temporal halves. The veins were quite full. Vision was reduced to ability to count fingers at two feet in either eye. Fields could not be plotted. The temperature, pulse, and hearing were normal. A Wassermann test made by his family physician was reported as negative. Because his vision began to improve he was not returned again until March 1st, one week after the first visit. During this week he had complained of a soreness in the lower back, his legs had felt weak, and his gait was uncertain. He had some difficulty in starting urination but there was no loss of sphincter control. Vision was thought to be much better.

Examination at this time showed vision in the right eye to be 20/40 — 1 and in the left eye 3/200. The knee jerks were hyperactive, about equal. A suggestive Kernig's sign was present on both sides. In the Rhomberg position there was slight swaying. There was spontaneous past pointing with the left hand but not with the right. A slight tremor of the hands in intentional movements was noted. The patient was a little ataxic, walking a line with difficulty.

He complained of pain on rotating the eyes up and out. Rotations were not limited. There was no nystagmus. The pupil of the left eye was a little larger than that of the right, both reacting to light and convergence. There was one small superficial retinal hemorrhage in the right eye and the pallor of the discs had not changed. Visual fields were normal in outline but showed enlarged blind spots and a large central scotoma in the right and a cecocentral scotoma in the

* Read before the Minnesota Academy of Ophthalmology and Otolaryngology, April 28, 1939.

left. Except for a faint recognition of blue, color sense was lost in the left eye. In the right eye the field for blue was about normal, that for red limited to within two or three degrees of the fixation point. Green was gone entirely.

Examination of the blood revealed 75 percent hemoglobin, 4,320,000 red blood cells, and 20,000 leucocytes, 89 percent of which were neutrophiles.

The patient rapidly became more ataxic, headaches, nausea and vomiting increased, and a definite scanning of speech developed. He was admitted to the hospital on March 4th. The interne's report on admission recorded a horizontal nystagmus. I did not observe this even during a period of extreme vertigo. For two periods of about 12 hours each vertigo was severe, the patient being unable to lift his head or even to turn to the right side. As long as he lay quietly on the left side he was comparatively free from dizziness.

The pulse was irregular and an electrocardiogram revealed a high-grade sinus arrhythmia. The interpreter of the tracing diagnosed myocardial disease. This subsequently proved to be an error as the arrhythmia disappeared. There was urinary retention and tenderness over the lumbar spine. The abdominal and all the tendon reflexes were more active on the left. The neck muscles were somewhat rigid. Temperature remained normal. He was unable to retain anything by mouth. After an enema, which he was unable to expel, he had, while asleep, two involuntary stools.

The spinal fluid showed a pressure of 19 mm. Hg; 180 cells, 90 percent of which were lymphocytes, 10 percent neutrophiles; chlorides, 756.0 mg.; sugar, 41.5; protein, 138.5; a trace of globulin. The Kline test was two plus but a specimen sent to the state laboratory was reported negative for both Kline and Kol-

mer. The colloidal gold curve was considered to be normal. X-ray studies of the ends of the long bones were negative for lead and no lead was found in the urine.

It was obvious that we were dealing with a widespread demyelinating disease of the central nervous system. The sudden onset in a boy of 15 with marked visual loss in both eyes, the very rapid development of alarming symptoms, and rapid recovery of vision appeared to distinguish it from multiple sclerosis to which disease it most nearly corresponded. A diagnosis was made of neuromyelitis optica.

The patient left the hospital on March 11th, one week after admission, apparently much improved. However, on March 16th his speech became impaired. He had difficulty in making himself understood, although he remained mentally clear. Diplopia developed but was transient. The incoördination of the arms and legs was persistent for several weeks. He was unable to tell the position of the extremities in bed. He had to be carried up and down stairs. At one time he had a crying spell which lasted for two or three hours. Different parts of the brain and cord appeared to be attacked by the disease without any progressive relationship as the symptoms shifted erratically. One by one they gradually disappeared until recovery was considered complete about 10 weeks after the onset.

A final examination was made on June 23d. When his mother was asked to send him in for this he was caddying on a golf course. He stated that he had no difficulty in seeing, walking, or talking and he appeared to be in normal health. A neurological examination showed slight spontaneous past pointing to the left. There was a little incoördination when he attempted to touch fingers together and in the heel-to-shin test. The Babinski reflex was suggestive. The abdominal and

tendon reflexes were normal. He walked normally, and there was no slurring of his speech. When the eyes were rotated sharply to the right there was a slight nystagmoid movement, none when rotated to the left. The temporal halves of the discs were quite pale, and the margins sharply outlined. Visual fields were normal for form and colors. The physiological blind spots were not enlarged. Vision was 20/25—1 in the right eye and 20/30—1 in the left. He read Jaeger 1 type with a little difficulty. There was no improvement with lenses.

The first recorded case of this disease was described by Sir Clifford Allbutt¹ in 1870. Among other interesting cases of spinal disease and injury Allbutt reported one of acute myelitis with what he called "sympathetic disorder" of the eyes. The latter came on 12 weeks after the subsidence of the spinal symptoms. The "sympathetic disorder" referred to was optic neuritis. There was partial recovery. A considerable number of cases were reported during the next few years. In 1894 Devic² reviewed the previously reported cases, added a case of his own, and named the disease. It was subsequently referred to as "Devic's syndrome." Probably the clearest early clinical description of the disease was given by Chisholm,³ an ophthalmologist of Baltimore, in 1882. The symptoms in his case began with pain on movement of the eyes. Within three days blindness was complete. The patient died on the twelfth day from progressive ascending paralysis from the feet upward.

In 1927 Beck⁴ reviewed the literature and found 70 recorded cases of paraplegia associated with blindness. He reported a case of his own. Of these 70 cases only 18 were recorded in the ophthalmic literature. In 18 of these, blindness came on first, in 36 myelitis was first to appear, and in 10 the two appeared simultaneously. In four the neuritis was

discovered only on routine ophthalmoscopic examination. In Beck's case, a girl of 15 years, the onset was sudden with headache, vomiting, drowsiness, and malaise. Six weeks later vision was suddenly lost.

In 1935 the literature was again reviewed by Walsh,⁵ who reported four cases of his own, one of which was studied pathologically. Altogether, a few more than 100 cases are recorded. About one third of these have come to autopsy and have had histopathological studies. The latest cases recorded are two by McKee and McNaughton⁶ in 1938. A large percentage of the cases have occurred in children in their 'teens or earlier. Balser,⁷ who reported four cases and studied three pathologically, believes that many of the cases recorded in the literature are undoubtedly instances of acute disseminated sclerosis. Because of its widespread involvement of the myelin sheaths, some neurologists consider the disease to be an acute form of disseminated sclerosis. Others, particularly those who have made histopathological studies, are emphatic in differentiating it as a separate disease. Hassin,⁸ after an exhaustive histological study of a case, concluded that it is a definite disease entity both clinically and pathologically. Other diseases which may produce lesions of both spinal cord and optic nerve are acute diffuse encephalomyelitis, widespread tumor of the central nervous system, cerebrospinal lues, and Schilder's disease. Tumor and lues offer little difficulty in diagnosis. Encephalomyelitis usually shows more mental symptoms and is generally self limited. Schilder's disease occurs earlier in life and blindness generally is of the cerebral type. The cord is rarely involved. Temporal atrophy of the disc is uncommon. Acute multiple sclerosis usually occurs in adults, and bilateral severe blindness is rare. Pathologically, according to Walsh, the

cerebellum in neuromyelitis optica is not involved, and the same author states that gliosis is absent in the latter disease. Brain⁹ has stated that "coincident bilateral optic neuritis with myelitis is unknown in multiple sclerosis" and also that multiple sclerosis rarely occurs in childhood. Beck detailed pathological findings which he considered further differentiated the disease from multiple sclerosis. Among these were (1) rarefaction and cavitation of the cord, optic nerve, and chiasma; (2) leucocytic exudates in these structures; (3) extensive demyelination through numerous segments of the cord; and (4) perivascular round-cell infiltration throughout the central nervous system.

In neuromyelitis optica rapid and marked loss of vision is probably the most characteristic symptom. According to Goulden¹⁰ it was the first symptom in 80 percent of the recorded cases. In the recovered cases, vision tends to improve nearly as rapidly as it is lost. This visual loss in most cases appears to be due to an optic neuritis, although some of the cases have shown lesions in the optic radiations. Papilledema has been reported a number of times. Klar¹¹ thought the edema that was found in his case to be due to a lesion immediately behind the eye. Walsh states that there is rarely an increase in the intracranial pressure. Venous engorgement, which occurred in my case, is frequently mentioned, usually, however, accompanied with some edema of the disc. Pallor of the temporal side of the discs is seen in most cases and is no different from that found in multiple sclerosis, unless it be more marked. Dilatation of the pupils may be due to visual loss or to irritation to the sympathetic nuclei in the medulla or cord. Orbital pain on movement of the eyes is a common complaint of the patients and was present in my case. The extraocular muscles are rarely

involved. In my case a transient diplopia developed. A great variety of fields have been described. Central scotomata are the most frequent type of field reported. Red and green disappear before the blue. Hemianopsia is not uncommon. Beck's case showed a bitemporal hemianopsia. Holden's¹² first four cases all showed such fields. One of Walsh's patients had hemianopsia and was operated on for pituitary tumor.

The myelitic symptoms generally consist of numbness and weakness, appearing first in the legs; ataxia; loss of sense of position of the extremities; retention or incontinence of urine and feces; weakness or loss of superficial reflexes and exaggeration of deep tendon reflexes.

Cardiac arrhythmia, such as occurred in my case, appears to be rare. One of Holden's patients had an arrhythmia without a demonstrable lesion. Death, when it ensues, is usually due to respiratory failure.

The etiology of the disease is obscure. A neurotropic virus has been suggested, and attempts have been made to isolate such a virus with no success. Lead was found in one case of neuromyelitis optica and in seven cases of multiple sclerosis in the urine, stools, spinal fluid, or blood cells or in all of these by Cone, Russel, and Harwood¹³ and considered to be a possible etiological agent. It is known, however, that lead is practically a normal finding in the stools and urine of healthy individuals. Lues, though found in two of the reported cases, is generally thought not to be an etiological factor.

No treatment is considered to be of any particular value. Most suggestions are empirical. High-vitamin diet and quinine have been suggested and were used in this case. Arsenic is said to be contraindicated. Walsh cautions against lumbar puncture and believes that any extensive surgical procedure is likely to exaggerate the

symptoms and may prove fatal. According to Goulden recovery has occurred in about 50 percent of the reported cases. If the cases of doubtful diagnosis are eliminated the percentage of recoveries is probably considerably higher.

SUMMARY

A case of acute diffuse myelitis with sudden blindness in a 15-year-old boy is reported. The fields showed large central scotomata and loss of color sense for red and green. There was deep orbital pain, particularly on rotating the eyes. Three weeks after the onset of blindness there was rapid development of myelitic symptoms beginning with weakness of the legs, uncertain gait, and soreness in the lower back. Retention of urine began early, and later there was constipation and incontinence of stools. The cord symptoms

spread upward. The patient developed extreme vertigo and loss of sense of position of the extremities. A high-grade cardiac arrhythmia developed and was misinterpreted as indicating myocarditis. The tendon reflexes were hyperactive. There were 180 cells in the spinal fluid and an increase in the blood leucocytes. Recovery was rapid and nearly complete.

While showing many of the symptoms of multiple sclerosis, the high degree of bilateral visual loss, the age of the patient, and no sign of relapse after several months would seem to distinguish it as a separate disease. The cases that have come to autopsy have furnished considerable pathological evidence that would tend to further differentiate this disease from multiple sclerosis.

1214 Medical Arts Building.

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TETANUS AND THE PROPHYLACTIC USE OF ANTITOXIN FOLLOWING INJURIES OF THE EYE*

DAVID G. COGAN, M.D.
Boston

It has been the practice of some eye hospitals, including that of the Massachusetts Eye and Ear Infirmary, to give tetanus antitoxin prophylactically in every case of perforating injury of the eye. This routine has been most recently recommended by Burger.¹ But the free use of antitoxin is not without undesirable features, and it is the purpose of this study** to determine whether or not the liability to tetanus following ocular injuries is sufficiently great and the prophylaxis by the antitoxin sufficiently certain to warrant its use in every case.

Tetanus is such a spectacular complication of ocular injury that one may assume that most, if not all, instances of it have been reported. The literature probably gives, therefore, a true indication of its frequency. Wagenmann² in 1907 was able to find in the literature only 14 case reports of the condition. By 1916 the number had been augmented, largely by war injuries, and Schneider³ was able to collect reports on 20 cases. In 1921 Collin⁴ collected 23 case reports including one of his own. One other case (Sattler's,⁵ 1918), which he had apparently overlooked, had been reported, bringing the total to 24. In the literature since 1921 to the present I have been able to find only 3 case reports of undoubted tetanus following perforating injuries (Jacqueau and Bujadoux,⁶ Burger,¹ Stark⁷), 1 probable but unproved case (Addario la Ferla's⁸ 2d case), and 1 following a traumatic keratitis without perforation (Ad-

dario la Ferla, 1st case). If the last two are included, the total number of case reports of tetanus following injury to the eye is now not more than 29. Approximately one half of these cases occurred before there was general use of antitoxin prophylactically,[†] and in none of these cases was antitoxin given before the onset of tetanic symptoms.

Apparently the agent inflicting the injury is of the utmost significance. One is impressed by the frequency with which horsewhips have been responsible. Of the 25 reports in which the nature of the inflicting agent is stated, no less than 10 were instances of horsewhip injuries. Two others were caused by objects which had previously had intimate contact with horses: 1 by a fragment of a horseshoe and the other by a pitchfork. Thus 12 injuries were known to be caused by agents associated with horses. Of the remaining cases in which the nature of the responsible agent is stated, 7 injuries were caused by objects associated with the ground (1 by a clump of earth, 2 by plant stalks, 1 by a broom, 1 by an arrow which had previously been stuck in the ground, and 2 by firecrackers). Thus agents which have been contaminated by direct contact with horses or with the ground account for the majority of cases of tetanus following ocular injury. Only 6 of the 25 reports did not give such a history. Of these 1 was caused by a "dirty piece of porcelain," 1 by cataract couching, 1 (the unproved case) by a splinter of wood, and only 3 (exclusive of the horseshoe injury mentioned above) by metallic foreign bodies.

* From the Howe Laboratory of Ophthalmology, Harvard University, and the Massachusetts Eye and Ear Infirmary.

** Suggested by Dr. F. H. Verhoeff.

† Prophylactic tetanus antitoxin was not in widespread use until the World War.

This is all the more striking in view of the frequency of the latter type of injury. One of these metallic injuries was caused by a piece of tool employed on wood, and it is possible that if a more complete history were available we might find a history of contamination with the ground in all three.

Tetanus following injury of the eye is usually accompanied by panophthalmitis or other form of severe endophthalmitis. There is a positive history of panophthalmitis in 16 instances, of hypopyon in 3, of corneal ulcer in 1, and of severe conjunctivitis in 1. In the remaining case reports the data given are insufficient to determine what ocular complications developed. But in no instance is there any indication that the eye did not show marked inflammation. This is interesting in view of the fact that suppuration is not necessarily a feature of tetanus infections elsewhere in the body. It is probable that the suppurative process in the eye is caused by organisms other than the tetanus bacillus. At least experimental inoculation of the eye in rabbits would suggest this (Ulrich⁹). When pure cultures of *B. tetani* are injected into the eye, only mild iridocyclitis will develop, and the organisms may actually be harbored for weeks with only a mild reaction. If, however, other organisms such as *B. subtilis* are simultaneously injected with the tetanus bacilli, panophthalmitis will develop as in the clinical cases under consideration. Tetanus is more apt to result from mixed inoculations than from injections of pure cultures of tetanus bacilli and this may well explain why panophthalmitis is such a common feature in the clinical reports.

In this connection it is also interesting that attempts to recover the organisms have been noted in at least five of the case reports in the above clinical series. *B. tetani* have been recovered twice: once

from the eye and once from the foreign body (two months after the injury and some weeks after the death of the patient!). In three instances no tetanus bacilli could be recovered. Tetanus bacilli were recovered from the ocular wound in one other case (Wirtz¹⁰) which is not included in the above series because tetanus never developed. This was again a horse-whip injury with perforation of the globe. As soon as the organisms were discovered, serum was given and clinical tetanus never occurred.

It would seem logical that removal of the eye might lessen the chances for generalized tetanus. But by the time panophthalmitis has appeared and enucleation is indicated, the tetanus infection may have extended beyond the eye. Thus of 8 patients who had an enucleation, only 1 recovered. One of the patients who died had actually had an enucleation on the day of the injury, before panophthalmitis developed. Of the 3 patients who had had an evisceration of the eye, on the other hand, 2 recovered and the outcome in the third is not stated. From this it might seem that evisceration was preferable to enucleation. Of the instances in which no operation was performed, probably the majority, recovery occurred in 2 with ultimate phthisis bulbi.

The general symptoms of tetanus following ocular injury usually begin from the sixth to eighth day and show at first the cephalic type of tetanus with lockjaw, facial paralysis, and ophthalmoplegia. This is followed by generalized convulsions. It is a severe type of tetanus, death having been noted to occur in 22 of the 27 case reports in which the end result is stated.

As previously stated, prophylactic antitoxin was apparently not used in any of the patients in this series, and there is no report of tetanus having occurred from ocular injuries where it was used. Further-

more, the relative infrequency of tetanus from ocular injuries during the war can doubtless be accredited to the liberal use of antitoxin, for many of the wounds must have been contaminated by ground containing tetanus spores. But it is well known that injuries elsewhere in the body have resulted in tetanus despite the prompt administration of prophylactic antitoxin. There is no reason to believe it could not likewise develop as a result of ocular injuries. It is possible that in the more severe infections the amount of antitoxin given prophylactically is insufficient. There is no contraindication to repeating the usual prophylactic dose of 1,500 units during the week following the first injection.

From this brief analysis certain conclusions may be drawn:

The development of tetanus following ocular injury is usually, if not always, associated with panophthalmitis. This panophthalmitis, however, is caused by organisms other than *B. tetani*. Enucleation does not offer any assurance against the development of generalized tetanus even when performed during the first 24 hours after the injury, and apparently does not affect the mortality rate.

Tetanus following ocular injury is obviously a rare catastrophe, for it has been reported in the literature only 20 times. That this relative infrequency is not simply the result of prophylactic antitoxin is apparent from the fact that there were only 14 case reports of the condition in the entire world literature before the days of prophylactic antitoxin. In view of this relative infrequency and of the danger incident to the administration of serum, it might seem that prophylactic use of antitoxin is never indicated following ocular injury. But practically all those injuries that did result in tetanus had been caused by objects associated with horses directly or with ground probably contaminated by manure. It would seem justifiable, therefore, to give antitoxin in those cases in which there is a history of such contamination. These would actually comprise a very small percentage of the total number of cases of injury to the eye. While a single prophylactic injection of 1,500 units is probably adequate, repetition of this once during the first week would be justified as an added precaution.

243 Charles Street.

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INTRAOCULAR FOREIGN BODIES

SOME COMMENTS BASED ON 120 CASES*

ELBERT S. SHERMAN, M.D.

Newark, New Jersey

The cases here recorded, which are consecutive and unselected, have all passed through my office during the past few years. There were a number of earlier ones, the records of which were either incomplete or not located. Not included are cases in which the foreign body had perforated the coats of the eyeball but was still in the wound and was removed by forceps or other means, and cases sent for examination by insurance companies, the Compensation Bureau, or other physicians. The conclusions are based largely on the failures and successes experienced in dealing with this series of cases.

One hundred and twelve (93 percent) of the foreign bodies were or presumably were magnetic steel. The others were copper, brass, rock, tungsten wire, carbon, bird shot, and nonmagnetic steel. There may have been other instances of nonmagnetic steel, but I have been reluctant to give this as a reason for failure to recover an intraocular foreign body.

The causes of the various accidents were:

Hammering or striking metal	
with a tool	73 (61 percent)
Flying particles	25 (21 percent)
Various causes	12 (10 percent)
Not recorded	10 (8 percent)

Location of the wound of entrance in this series:

Cornea	69 (57.5 percent)
Limbus	10 (8.3 percent)
Sclera	27
Sclera and ciliary body 14}	41 (34.2 percent)

* Read before the Ophthalmological Section, New York Academy of Medicine, May 15, 1939.

In 223 cases reported by Allport:¹

Cornea	112 (50.2 percent)
Limbus	21 (9.4 percent)
Sclera	90 (40.3 percent)

In several of the cases the upper or lower lid was also perforated.

Most of the foreign bodies were 2 to 4 millimeters in the greatest dimension. Larger missiles cause such great and immediate damage by their lacerating, contusing, or concussion effects that the restoration of good vision is infrequent; moreover, they are more likely to carry infection into the eye.

The largest foreign body in this series was a sliver of steel that had passed completely through the eye. The anterior end was in the orbit in contact with the globe, and the posterior end was in the sphenoid sinus on the opposite side. It was withdrawn with forceps after the eye had been enucleated.

The largest piece of steel that I have removed from the vitreous without great loss of vision was a rough chip 8 mm. by 3.5 mm. in size. It entered through the upper margin of the cornea of the right eye, tearing away a large piece of the anterior layer of the iris. The lens was not injured. The roentgenologist located the foreign body in the upper part of the vitreous, the posterior end being 13 mm. behind the cornea. It was removed the day after the accident, through the wound of entrance, with a Lancaster hand magnet. Adherent to it was the missing piece of iris. Two months later the vision was 20/50 with a quiet eye. After the lapse of two years the

man returned for treatment of an injury of the cornea of the left eye. The condition of the right eye was unchanged. Nearly five years after the injury of the right eye he was again sent to me for another injury of the same eye. There was a wound of the upper lid and a laceration of the bulbar conjunctiva. The vision was then 20/40.

In 54 (45 percent) cases the lens was injured; uninjured in 64 (53.3 percent);

There were no cases of sympathetic ophthalmia, although enucleation was refused after being advised for several severe injuries of the ciliary body. There were 14 enucleations and in 8 cases enucleation was advised but not permitted.

In only two cases did detachment of the retina occur—one after removal of the foreign body through an incision in the sclera and the other when removal was by the anterior route. Recovery oc-

TABLE 1
LOCATION OF FOREIGN BODY WITH RESULTANT VISION

Location of Foreign Body	No. of Cases	Blind Eyes and Enucleations	Vision						
			Less than 20/200	20/200 to 20/100	20/100 to 20/70	20/70 to 20/50	20/40	20/30	20/20 or better
Vitreous, retina, and postscleral wall	82	22	20	1	3	5	2	12	17
Lens	removed	5		3				1	1
	not removed	5	1	1		1	1		
Ant. chamber and iris	17							4	13
Posterior chamber	3					2		1	
Orbit (double perforation)	8	1	3	1	1	1		1	
Total	120	24	24	6	4	9	3	19	31

lens injury was undetermined in two. However, in 20 of the cases in which the lens was uninjured the foreign body did not penetrate farther than the posterior chamber.

Siderosis bulbi was observed in seven eyes. The shortest period of its development was, as nearly as could be determined, about five months. However, according to Davidson,² Mayou,⁴ and others, siderosis may appear much earlier than this. No instance of the disappearance of siderosis was noted. Vogt⁵ reported one case.

Several times after negative reports by roentgenologists the presence of an intraocular foreign body was demonstrated.

occurred in both without operation. The vision in each case was 20/30. Most of these injured eyes were seen soon after the accident occurred—many of them within two or three hours or less, and the foreign body was removed as promptly as possible. In 74 cases removal was effected during the first 48 hours after the accident, in 46 of these within 24 hours. However, in a number of instances the foreign body had been retained for many months.

Table 1 shows the location of the foreign body in 120 cases and the visual acuity at the time of the latest observation.

Table 2 shows the route by which the

foreign bodies located in the vitreous or retina were removed, and the visual results.

It is apparent that 16.6 percent of the foreign bodies were in the anterior segment of the eye, 8.3 percent were in the lens, 68.3 percent were in the posterior segment, and 6.6 percent were in the orbit. Of the 82 cases of posterior-segment foreign body, the patients in 47.5 percent recovered with vision of 20/70 or better. Twenty-nine (35 percent) of these had 20/30 or better.

face. The posterior end had perforated or was embedded in the iris. It was removed with forceps through a peripheral incision in the cornea. The eye recovered promptly with normal vision.

The eight cases of double perforation were interesting in that in only one was there much inflammatory reaction. Four that recovered with less than 20/200 vision had cataracts caused by perforation of the lens by the missile. All would probably have had better vision if the cataracts had been removed, as there was

TABLE 2
FOREIGN BODY IN VITREOUS AND RETINA, REMOVAL ROUTE, AND VISION

	No. of Cases	Blind Eyes and Enucleations	Vision						
			Less than 20/200	20/200 to 20/100	20/100 to 20/70	20/70 to 20/50	20/40	20/30	20/20 or better
Removed by anterior route	44	12	11		2	4	2	8	5
Removed through sclera	27	7	6		1	1		3	9
Not removed	11	3	3	1				1	3
Total	82	22	20	1	3	5	2	12	17

The visual results for the whole series were 20/70 or better in 51.6 percent and 20/30 or better in 41.6 percent.

As would be expected, the results in the patients in whom the foreign body was in the anterior chamber or iris were much better. Of these there were 17. All of them recovered with at least 20/30 vision—4 had 20/30 and 13 had 20/20. In all but one instance the foreign bodies were particles of steel. The exception was a very fine piece of tungsten wire from an incandescent-lamp filament. A factory worker was testing lamps when one exploded and something struck her eye. It was found that a piece of the filament had perforated the cornea and was broken off flush with the anterior sur-

no indication of retinal detachment or other serious intraocular disturbance.

Two of the double-perforation cases are worth describing briefly:

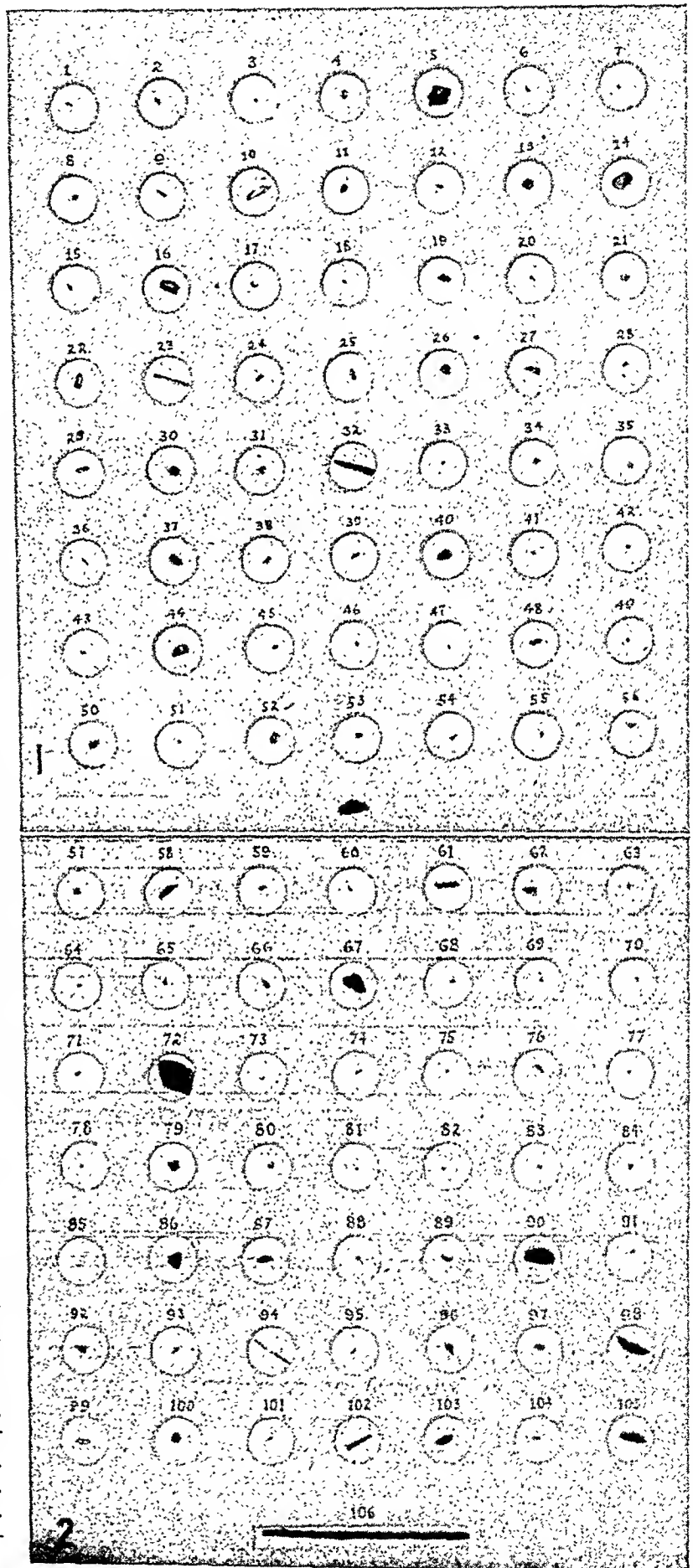
Case 1. While duck hunting, a young man was struck in the right eye by bird shot. When he came to me three days later there was a closed, perforating wound in the right lower lid and another in the sclera 3 mm. below the cornea. In the retina, well below the disc on the nasal side, there was a fairly large hemorrhagic area. The roentgen examination showed a round foreign body, 4 mm. in diameter, a short distance behind the eyeball. The eye was fairly quiet and remained so. The vision was ability to see hand movements. Over two years later

the media were clear. There was a fairly large pigmented scar in the fundus at the site of the wound of exit. The vision was 20/50.

Case 2. A man, aged 33 years, while striking a chisel with a hammer, was struck in the right eye by a chip of steel. He came to me one hour after the accident. There was a small wound in the sclera 2 mm. below and to the nasal side of the cornea. A wound could be seen in the retina well below and to the temporal side of the disc. Except for two air bubbles and a little blood the vitreous was clear. The vision was 20/30. The roentgen examination revealed a foreign body 3 mm. by 1 mm. in the orbit, just outside the eyeball. There was no response to the giant magnet. The next day a hemorrhage into the vitreous reduced the vision to 20/200. This cleared up rapidly, and three weeks later the vision was 20/20, and the man had returned to work. Two years later the vision was 20/20.

The only case of uncomplicated, retained intraocular foreign body observed over a long period occurred in a young man whose left eye was perforated through the sclera by a piece of steel.

Figs. 1 and 2 (Sherman). Various sizes and shapes of over 100 intraocular particles of steel. Diameter of circles is 12.5 mm. No. 106 is the piece, 57 mm. long, shown in the roentgenogram.



The foreign body could be seen deep in the vitreous. The X-ray localization was 17 mm. behind the cornea near the median line, and the estimated size was $4\frac{1}{2}$ mm. by $7\frac{1}{2}$ mm. The tool from which it was thought to have come was magnetic steel. All attempts to move it with a magnet were futile. There was very little reaction and the eye recovered promptly but with vision reduced to light perception. Eleven years later the eye had remained quiet, the vision was 5/200 and the location of the foreign body was apparently unchanged.

Of the 82 foreign bodies in the vitreous and retina, 44 were removed by the anterior route, and 27 through the sclera; 11 were not removed. Most of the latter were nonmagnetic. Twenty-three (52.3 percent of the 44 eyes from which the removal was by the anterior route were industrially blind (less than 20/200), and 21 (47.7 percent) had 20/100 to 20/15 vision; 13 (29.5 percent) of these recovered with vision of 20/30 to 20/15.

Thirteen (48 percent) of the 27 eyes from which the removal was through the sclera were industrially blind and 14 (52 percent) had 20/100 to 20/15 vision; 12 (44.4 percent) of these recovered with vision of 20/30 to 20/15. These figures are not offered as proof of anything. The number is too small to allow any conclusions to be drawn, from the visual results, as to the comparative value of the two routes. However, a review of the records shows that the foreign bodies removed through the sclera were larger, and the primary injuries often more serious—the ciliary body, in several instances, being severely injured. On the other hand, the anterior route was often chosen when the lens was badly damaged.

Some writers have criticized reports of good visual results following the removal of foreign bodies from the vitre-

ous, by calling attention to the fact that in most instances the period of observation has been too short; that late degenerative changes and detachments of the retina often completely change the picture. Twelve eyes in my series of cases in which there was recovery with good vision (20/30 to 20/15), and in which foreign bodies were removed from the vitreous through the sclera, were followed up for periods varying from six months to 15 years, the average period of observation being four years. In none was there any deterioration of vision, and in several there was considerable improvement. In only one was there detachment of the retina. This occurred four weeks after the removal of a chip of steel, 2 mm. by $2\frac{1}{2}$ mm. in size, which had entered through the sclera and ciliary body. There was considerable hemorrhage into the vitreous. Vision was reduced to the ability to count fingers at 2 feet. The foreign body, after X-ray localization, was removed through a scleral incision with a hand magnet. Four weeks later the vision, which had been 20/40, was suddenly reduced to 20/200 as a result of a small detachment of the retina near the site of the extraction. This became reattached during three weeks confinement to bed, and remained in place. Nine months later the vision was 20/30. Five years later, when the man returned because of a minor injury of the same eye, it was still 20/30.

It was impossible to keep some eyes that recovered with good vision under prolonged observation, but as nearly all of these were workmen's compensation cases in which the claim could be reopened within two years, it is more than likely that I would have heard from any that had deterioration of vision within that time. In many of the patients who sustained great permanent loss of vision from cataract, organized exudates in the

vitreous, and other causes, there was, of course, no way of determining whether subsequent changes, such as detachment of the retina, occurred.

If it is safe to draw any conclusions from such a small number of cases, it would seem that detachment of the retina following removal of a foreign body through an incision in the sclera is not necessarily a frequent sequel, and that the statement of a writer⁶ on this subject that "It is significant that the longer the period of time elapsing, the greater seems to be the diminution of vision" is rather pessimistic.

Probable factors in my comparatively favorable late results are early removal of the foreign body in most cases, and my refraining from entering the vitreous with magnet tips or instruments. Only recently have I used electrocoagulation or other similar means for preventing retinal detachment.

The entrance of a foreign body into the eye is always a serious matter, the ultimate result of which no one can foretell. No two cases are alike, and in each the selection of the proper procedure should be influenced by the conditions present. Adequate equipment (a point stressed by Lancaster⁷), experience, and good judgment are often the deciding factors between success and failure. Bane⁸ says that "training in the use of the magnet is as important as that for the removal of a cataractous lens."

In the event of a recent invasion of the eye by a foreign body, particularly when it is iron or steel, temporizing is definitely bad practice. It should be removed as soon as a thorough examination can be made, including an X-ray localization when needed. To me this seems so important that in some cases of an open wound, when a roentgen report could not be had promptly, I proceeded without it rather than delay re-

moval for even a few hours. After the eye has become red and painful, the operation is more difficult and dangerous. Furthermore, the foreign body may in a short time become bound down by exudate or a blood clot, so that in the case of a small foreign body the magnet cannot dislodge it, or if it is larger and



Fig. 3 (Sherman). Roentgen localization of piece of steel 57 mm. long. Anterior end in right orbit, posterior end in left sphenoid sinus.

does respond to the magnet the tissue or structure to which it is adherent may be damaged. Würdemann⁹ says that "Early extraction is essential even though exact localization has not been made." Occasionally, after an eye has been struck by a very small particle of steel, it is not easy to determine without a most careful examination whether there has been a perforation. There may be no pain or redness, and the vision may be good. This is illustrated by a case seen a few months ago. A man while striking a tool with a hammer felt something strike his eye. I saw him an hour or two

later, but could find no wound or other evidence of injury, and the vision was 20/20. There was no pain. As a precaution, a mydriatic was used. I could then see a small opacity in the extreme upper part of the lens, and a chip of steel not over a millimeter in size lying on the lower half of the retina. A further search then disclosed a very small, almost invisible wound in the limbus.

Another man with a similar history had what looked like a superficial wound in the lower part of the cornea and a tiny, dark spot on the iris which looked like pigment, almost out of sight in the iridocorneal angle. With the slitlamp it could be seen that the wound was a perforation and that the dark spot was a piece of metal. Injuries of this type are not infrequently overlooked until months later, when cataract develops, siderosis, or other sequelae. I have encountered several such cases in which an earlier X-ray report was negative.

I can recall no case in which, following a recent accident, a foreign body was demonstrated by the X ray or other means to have been within or to have passed through the eye, and in which evidence of perforation could not have been discovered by an ordinary careful clinical examination. I do not want to be understood as depreciating the value of the roentgen examination. What I would emphasize is, that while it is often useful or even a necessity, it should not be depended on to furnish or confute evidence readily available by the use of our own senses or office armamentarium. This is, of course, true concerning other laboratory aids to diagnosis in various fields of medicine. A reliable history of the accident giving information as to the size, velocity, and chemical composition of the particle is often an aid in deciding when and how to proceed.

In the case of a recent wound of the

eyeball, particularly if the media are cloudy, it is sometimes difficult to determine whether a foreign body has struck the eye and rebounded, or is within the globe or orbit. Here the X ray will usually furnish accurate information, besides indicating the approximate size and shape and location of the object. If, after a negative roentgen report, there is still some doubt, the magnet may be used. This is the only situation in which its use for diagnostic purposes is permissible. A possible exception is when a foreign body of unknown material can be seen in the anterior chamber or iris; the magnet may be used to determine whether it is magnetic. When there are indications that the foreign body is very small, the roentgenologist should be informed, so that he may take extra care with his technique and examination of the films.

Pictures of the Haab technique for removing a foreign body from the globe show the patient seated before the giant magnet, which is mounted on a stand. Lacking better facilities, I have many times removed a foreign body by this method and have experienced the difficulties with which many are doubtless familiar. We now have the operating room equipment so arranged that the Haab magnet, when needed, can be used with the patient on an operating table with his head under perfect control, although with the Sweet and smaller Lancaster magnets available, the larger magnet is required less frequently.

Foreign bodies in the anterior segment are usually small, and the wound in the cornea usually closes quickly. Consequently, if aqueous has been lost, the anterior chamber is soon restored and the foreign body, if magnetizable, can, as a rule, be easily maneuvered with a hand magnet to the point selected for its exit. Contrary to the advice of some surgeons,

including Verhoeff,¹⁰ I prefer to remove it through a keratome incision in the limbus *above* rather than *below*, because in some cases even with a well-dilated pupil, entanglement in the iris occurs, necessitating an iridectomy. A coloboma in the upper part of the iris causes comparatively little disability or disfigurement, but when it is below, it is unsightly and, what is more important, the resultant dazzling is persistent and very troublesome. Before attempting magnet removal of a foreign body from the anterior chamber, the pupil should be well dilated. The importance of this has been emphasized by Barkan,¹¹ Evans,¹² and others. For this purpose 3 or 4 drops of 1:1000 epinephrine subconjunctivally, or a drop or two of a 1:100 solution on the cornea are preferable to atropine. With the former, prolapse of the iris is less likely to occur, and the mydriasis can be more quickly reduced with a miotic, when this is indicated. Concerning the incision, Verhoeff¹⁰ mentions a precaution which I have learned from experience is important. He advises that the point of the keratome be entered as far back from the limbus as possible, without danger to the lens or the iris. If the incision is too far forward, the corneoscleral shelf may prevent the foreign body from entering the wound. I have made this error, and the ensuing difficulty in removing the foreign body was considerable. In dealing with particles of steel in the anterior chamber, whether they have remained there or have been drawn forward from the vitreous, it should be remembered that a good hand magnet has almost as much attracting force at short range as a large one, and, as it is more easily manipulated, is much safer.

Whether it is safer to remove a foreign body from the vitreous by the anterior route, or through an incision in the

sclera, has been a subject of controversy since the days of Haab and Hirschberg.

Among recent writers on the subject, Verhoeff¹⁰ advocates the anterior route. He says, "For many years I have accepted the teaching of Haab that the safest way to remove a magnetic foreign body from within the eye is through the anterior chamber. Those who advocate removing it through a posterior scleral incision are, I believe, influenced by the fact that the method is simpler and does not require so powerful a magnet. The danger of subsequent separation of the retina is undoubtedly far greater after a scleral incision, and for this reason the posterior route, in my opinion, should never be used unless it is found impossible to bring the foreign body from behind the lens, or there is a large open wound in the sclera." Walter F. Duggan,¹³ after reviewing the results in 270 cases from the records of the Knapp Memorial Hospital, concludes that "A scleral wound (operative or accidental) seems definitely to favor the development of a detached retina, a vitreous exudate, or both. It should be used only when other methods of removing a foreign body fail."

On the other hand Stieren,¹⁴ who at the time of writing had performed more than 700 magnet extractions, does not use the anterior route at all, and claims satisfactory results by a scleral incision and direct removal of the foreign body from the vitreous. Numerous other writers, such as Allport, Shoemaker, de-Schweinitz, and Sweet, prefer the posterior route. Sweet¹⁵ said, "Retinal detachment is not a logical result of a scleral incision for the extraction of a foreign body from the vitreous chamber. The exudation associated with a long-retained foreign body is probably a more frequent cause of detachment."

Formerly, I removed or attempted to remove particles of steel from the vitre-

ous through the anterior chamber, according to the method of Haab, but during the past 20 years have been using the posterior route with increasing frequency. One reason is that we are better equipped with small magnets and other facilities; furthermore, the results have justified the change. At present, my practice is as follows: If the foreign body has entered through the limbus or sclera I prefer, in most cases, to remove it through an incision in the sclera located near the foreign body, as indicated by ophthalmoscopic or roentgen examination. If the wound of entrance has not closed, it is sometimes better to use that, enlarging it if necessary, rather than a new incision. If the foreign body is small and has passed through the cornea and lens, especially if it is in the anterior part of the vitreous, a safer method is to bring it forward rather than make an incision in the sclera. In some cases the eye is so badly injured that the only thing to do is to get the foreign body out as easily as possible. This will usually be through the wound of entrance.

The following procedure has been satisfactory for removing particles of steel through a scleral incision: After exposing a sufficient area of sclera, two fine silk sutures are placed, 2 mm. apart, superficially in the sclera, usually, but not always, as near as possible to the location of the foreign body. The sclera is then incised meridionally between the sutures, care being taken not to cut the choroid. The length of the incision is based on the estimated size of the foreign body. The conical tip of the Lancaster hand magnet or a larger magnet is brought gradually in contact with the wound, the edges of which are then separated by traction on the sutures.

By thus retracting the edges of the wound at the proper time, a foreign body

can often be removed through a smaller incision than without this aid, and with little or no loss of vitreous. Traction is relaxed as the foreign body emerges. As the choroid begins to bulge the foreign body usually perforates it. If not, it must be incised. The sutures are also an aid in steadying the eye. Phenobarbital given two or three hours before, if time permits, morphine hypodermically an hour before the operation, and akinesia of the orbicularis make the operation safer and easier. A foreign protein, preferably typhoid vaccine intravenously, given immediately before or after the operation, is a safeguard against infection.

In all cases one should endeavor to stir up or injure the vitreous as little as possible. Injudicious attempts to remove a foreign body from the vitreous by the introduction of magnet tips and other instruments are likely to do more harm than good, and probably account for many of the cases of detachment of the retina and other serious sequelae which have been reported.

There are some instances when it is probably better not to attempt to remove an intraocular foreign body. This is a decision which sometimes must be made in the case of a long-retained foreign body that is inactive, and the attempted removal of which is likely to damage the eye seriously. Bulson, several years ago, discussed this subject and cited a number of cases of retained intraocular foreign bodies that remained innocuous for years. However, these cases are rare, and they should not be cited as an excuse for not making every reasonable effort to remove a foreign body, particularly recent ones, unless the chances are that the damage caused by its removal will be greater than that of its retention.

671 Broad Street.

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VISUAL-ACUITY TESTS*

SAMUEL S. BLANKSTEIN, M.D.
Milwaukee, Wisconsin

AND

MARY JANE FOWLER, M.D.
Chicago

The use of the Betts test** as a method of visual testing in schools has increased considerably in the past few years, but no data have been presented in the ophthalmological literature as to its relative accuracy. A comparison of its individual components comparable to standard ophthalmic tests would seem to be necessary before any ophthalmologist could advise educators as to their use. This study was made to evaluate only the relative accuracy of the visual-acuity portion of the Betts test, as compared with a standard Snellen chart. Later we intend to evaluate the other portions of the test. The only report in the ophthal-

mological literature is a study by Hitz† on a group of 32 children. A total of 48 tests for visual acuity by a Snellen chart with uniform illumination and the Betts test for visual acuity showed that the two tests agreed in 74 instances or 77 per cent. A 20-percent difference was allowed, using the industrial percentages of visual-loss tables, as adopted by the American Medical Association.

Our study consisted of a comparison of the two tests; namely, a standard Snellen chart with uniform illumination at 20 feet; and the Betts cards for visual acuity used in the stereoscopic apparatus and illumination as provided by the manufacturer. The results can be divided into two groups. One group was tested in the clinic and consisted of adults ranging in age from 16 to 60; the other group con-

* From the Division of Ophthalmology, Department of Surgery, the University of Chicago; E. V. L. Brown, director. Research aided by a grant from the Keystone View Company.

** Cards DB1, DB2, DB3 of the Keystone diagnostic series were used, as supplied by the Keystone View Company.

† Hitz, J. B. Amer. Jour. Ophth., 1938, v. 21, p. 1024.

sisted of children tested in a graded school‡ under similar conditions. The age limits were from about 7 to 12 years

It was decided in making a comparison of the two tests to use the Snellen rating as a basis and not the "visual efficiency" percentages designed primarily for industrial purposes. Practically all visual acuities are now recorded by ophthalmologists in some form of Snellen decimals or fractions, such as 20/20, 1.0, or 6/6. The distribution of the dots of the Betts cards for visual acuity is convenient, as far as visual-efficiency percentages are concerned, because they progress numerically uniformly from 20 to 110 percent. How-

In making a comparison of the results of the two methods of determining visual acuity, the amount of error allowed obviously affects the final result. Our figures have been interpreted and tabulated by the use of two different allowances. The first results were obtained by allowing only a difference of anything less than 0.1 up to 0.6 vision, and 0.2 up to 1.2 vision as represented on the Snellen chart. Thus the allowance is anything less than a full line on the Snellen chart. Snellen 1.2 and 1.5 were considered equivalent to 1.3 on Betts cards. For example, if a patient obtained dot no. 7 or 0.44 on the Betts test, and 0.6 on Snellen chart, this was con-

TABLE 1
COMPARISON OF VISUAL-ACUITY RATING CHARTS*

A.M.A. rating†	20%	30%	40%	50%	60%	70%	80%	90%	100%	105%	110%
Snellen-letter-chart values	0.1 = 20/200	0.13 = 20/150	0.16 = 20/122	0.2 = 20/100	0.27 = 20/75	0.33 = 20/60	0.44 = 20/45	0.6 = 20/33	1.0 = 20/20	1.3 = 20/15	2.0 = 20/10
Betts Test-Card‡ (dot arrangement) Values	1	2	3	4	5	6	7	8	9	10	11

* According to Keystone View Company Publications.

† Section on Ophth. A.M.A. 1925, p. 370.

‡ Each successive number represents a higher visual acuity.

ever the distribution coincides only fairly well with the lines on a standard Snellen chart (see table 1).

The Snellen chart used by us progresses evenly from 0.1 to 0.6 in 0.1 steps, jumps to 0.8, then to 1.0, 1.2, 1.5, even 2.0 in some cases. However, the Snellen comparison of the Betts cards goes from 0.1 to 0.6 inclusive in eight steps, the interval between them becoming larger. It then jumps from 0.6 to 1.0. Thus it is obvious that a comparison with Snellen ratings is apt to lead to error because of the considerable jump between 0.44 to 1.0 Keystone; that is, dots 7 and 9, between which there is only one division.

‡ The University of Chicago Elementary School.

considered a plus value in favor of Snellen chart because there was at least 0.1 or more difference. Similarly 0.6— on the Snellen chart as compared to 0.44 on Betts cards was also considered a plus value. If the Snellen chart showed 0.5, 0.5— or 0.5+ this was considered as corresponding to no. 7 dot or 0.44 on the Betts card because 0.5, 0.5— or 0.5+ was not a whole line or a full 0.1 difference. The plus sign was added to a Snellen chart value where the patient obtained less than majority of the letters of the subsequent line. Where more than the majority, but not the total number of letters of that line were attained, a minus sign was attached to the value of that line.

The second results were obtained in

cases in which a larger allowance was made. The difference allowed was a full (total) line or 0.1 difference for Snellen vision 0.6 or less. An allowance of 0.2 was made for vision between 0.6 and 1.2. Snellen 1.2 and 1.5 were considered equivalent to 1.3 and 2.0 on Betts cards, respectively. Also 1.5 on the Snellen chart and 1.3 on the Betts cards were considered equivalent. More than one whole line of difference was considered necessary for a disagreement. If the Snellen chart showed 0.8 and Betts cards 0.6, this was considered as an agreement of values, but an 0.8+ on the Snellen chart was considered a plus Snellen value as compared to 0.6 on Betts cards. An 0.5 Snellen-chart value would still be in agreement with an 0.6 on Betts cards, but 0.5— on Snellen chart gave a minus Snellen value as compared with 0.6 on Betts cards, because there is more than 0.1 difference between the two values.

In taking these Snellen-chart visions, the patients were not "pushed" or coerced but were given enough time to read the individual letters that were pointed out to them. It was definitely noticed that vision of an individual eye was somewhat better if the other eye was closed by the subject's finger or if he voluntarily closed the lid. With both eyes open and using a white card for a cover over one eye, the vision of the other eye appeared somewhat blurred. The factor of suppression or of a blur may be introduced in this manner. Use of a black card or paper was not attempted to see if that would reduce the interference.

In this connection a similar suppression factor arose very strikingly in the use of the Betts cards. When the Betts stereoscopic cards were used, with the black dots within the white diamonds presented to only one eye while the other eye viewed only the white diamonds, the visual acuity of the eye viewing the black

dots would immediately rise one or more smaller dots on occluding the view of the other eye with a card so that the chamber in front of that eye became considerably darkened. This occurred in 24 percent of the individual eye examinations of adults and in 39 percent of individual eye examinations of children. One might expect this to be especially true where one eye was amblyopic and suppression played a considerable part. However, it occurred very often where vision was ultimately normal both by Betts cards and Snellen chart tests. The occlusion procedure was used in every case in which the vision in the individual eye when the dots were presented to only one eye (although both eyes were open) was lower than the vision of both eyes when the dots were presented to each eye. The best vision obtained was the figure used in our final tabulations. It occurred to us that this suppression might be related to the problem of the master eye and corresponded closely in a few cases; but too few were tried to allow any definite conclusions to be drawn. This is to be further investigated. The phenomenon is closely related to that which occurs when Snellen-chart vision is taken with one eye covered by a white card. Of course the stereoscopic cards allow a higher degree of suppression to take place.

We feel that as far as visual-acuity estimations were concerned, one method is as rapid as the other. The time consumed in reading more letters on the Snellen chart than there are dots on the Betts cards is equaled by the time necessary to explain what is wanted from the stereoscopic slides. Naturally, to older children and those who had previously had this test, such explanations were unnecessary, but this, in turn, was balanced by the many pupils who could read the 1.5 Snellen chart line at the outset. The new and strange features of the Betts cards

somewhat confused some second- and third-grade children who rapidly responded to the familiar letters of the Snellen test.

RESULTS

ADULT GROUP (see table 2)

First results: (see allowances above)

A record was made of 466 visions; 310 were of individual eyes and 156 records were of examinations made when both eyes were in use at the same time. Of the 310 individual eyes examined agreement was noted in 171, or 55 percent. Eighty-

A further analysis of the results showed that of the 310 individual eyes examined, 195 had a Snellen-chart vision of 1.0 or over and 115 had a vision of less than 1.0. Of those with 1.0 vision and over, there was agreement of visual acuity values in 64 percent of cases, 24 percent gave a higher Snellen-chart value, and 12 percent gave a lower Snellen-chart value. Of those with less than 1.0 vision, only 40 percent were in agreement, 26 percent gave a higher Snellen value, and 24 percent a lower Snellen value. Obviously the Betts cards were more discriminatory for visions less than normal,

TABLE 2
COMPARISON OF SNELLEN-CHART AND BETTS-CARD VALUES

First Basis. allowance of less than a full line on Snellen chart

	Adult Group		Child Group	
	Single Eye	Both Eyes	Single Eye	Both Eyes
Number of eye examinations	310	156	614	306
Percentage in agreement	55%	60%	57%	51%
Percentage with higher Snellen-chart value	29%	18%	19%	26%
Percentage with lower Snellen-chart value	16%	22%	24%	23%
<i>Second Basis: allowance of a full line on Snellen chart</i>				
Number of eye examinations	310	156	614	306
Percentage in agreement	67%	78%	75%	69%
Percentage with higher Snellen-chart value	23%	13%	10%	11%
Percentage with lower Snellen-chart value	10%	9%	15%	20%

nine, or 29 percent, gave a higher visual acuity; 50, or 16 percent, gave a lower visual acuity with the Snellen chart. With both eyes, 156 examinations showed that 94, or 60 percent, were in agreement; 29, or 18 percent, gave a higher value; and 33, or 22 percent, gave a lower visual acuity with the Snellen chart. Hence, with individual-eye examination the Betts test is more discriminatory than the Snellen chart, but with both eyes the reverse is true. The total group of 466 visions showed 57 percent in agreement, 25 percent with a higher, and 18 percent with a lower Snellen-chart value.

and corresponded less to Snellen-chart values. Of the 156 binocular examinations, 119 had 1.0 and over and 37 had less than 1.0. Those with vision 1.0 and over had an agreement in 66 percent of the visions, 15 percent had a higher, and 19 percent a lower Snellen value. Of visions less than 1.0 only 40 percent were in agreement, 30 percent had a higher, and 30 percent a lower Snellen-chart value.

Second results: (see allowances above)

Of the 310 individual eyes examined, 67 percent were in agreement, 23 percent gave a higher, and 10 percent a lower

Snellen-chart value. When both eyes were open, in 156 examinations there was agreement in 78 percent, 13 percent gave a higher, and 9 percent a lower Snellen value. The composite figures of 466 visual acuities showed agreement in 71 percent of cases, 20 percent gave a higher, and 9 percent a lower Snellen value. Thus we can see there is considerably more agreement where more allowance was made. Here a full line of Snellen was allowed.

CHILD GROUP (see allowances above)

Of 920 visual-acuity estimations, 614 were individual eyes examined and 306

of 132 individual-eye examinations on second-grade pupils with 136 individual-eye examinations on sixth-grade pupils showed that 53-percent agreement occurred with second-grade students and 58-percent with sixth-grade students. This small difference we believe to be within limits of practical error and shows again that age is not a factor from the second grade up. No attempt was made to incorporate kindergarten or first-grade pupils, because teachers and school physicians had failed to obtain satisfactory visions by either method, and it was thought that the time spent would not produce results accurate enough for this study.

TABLE 3
VISUAL ACUITIES

	Single Eyes		Both Eyes	
	Snellen Chart	Betts Cards	Snellen Chart	Betts Cards
<i>Adult Group</i>				
Eyes examined	310	310	156	156
Percentage (normal=1.0)	63%	66%	76%	81%
Percentage less than normal	37%	34%	24%	19%
<i>Child Group</i>				
Eyes examined	614	614	306	306
Percentage (normal=1.0)	79%	82%	90%	84%
Percentage less than normal	21%	18%	10%	16%

binocular. Of the 614 individual eyes examined, 57 percent were in agreement, 19 percent had a higher, and 24 percent a lower Snellen-chart value. Of the 306 with both eyes examined, 51 percent were in agreement, 26 percent gave a higher, and 23 percent a lower Snellen-chart value. Practically speaking, the individual-eye examinations corresponded to those of the adult group with the same allowances. The binocular examinations corresponded within 9 percent. Apparently age is no factor in determining the results. Here the Snellen chart was more discriminatory, for there were lower Snellen values than Betts values. A comparison

Second results: (see allowances above)

Of the 614 individual-eye examinations, 75 percent were in agreement, 10 percent gave a higher, and 15 percent a lower Snellen value. The 306 binocular visual examinations showed 69 percent in agreement, 11 percent with a higher, and 20 percent with a lower Snellen value. Again a similar rise in the percentage of agreement occurred in the child group; however, the rise was greater by almost 6 percent in the individual-eye examinations than in the adult group. Consequently, it can be seen that with what is considered a fair allowance, the greatest agreement of individual-eye examination was 67

percent in the adult group and 75 percent in the child group. With both eyes, 78 percent in the adult group and 69 percent in the child group were in agreement.

A calculation of the percentage of visual acuities that were found to be normal with the Snellen chart as compared with Betts cards showed very close agreement, taking 1.0 vision as being normal (table 3). In the adult group, 63 percent of the individual eyes examined with the chart were 1.0 and over, 37 percent less than 1.0; with the Betts cards 66 percent were 1.0 and over, and 34 percent less than 1.0. The agreement shows only a difference of 3 percent in the figures, an error of only about 4.5 percent. Where both eyes were examined, 76 percent were normal with Snellen chart and 81 percent by Betts cards, a difference of 5 percent or an error of almost 7 percent. In the child group of 614 individual eyes examined, the Snellen test showed 79 percent with normal vision and the Betts cards 82 percent, a difference of only 3 percent, or an error of almost 4 percent. With both eyes open, 90 percent had normal vision using the Snellen chart and only 84 percent using Betts cards, a difference of 6 percent or an error of 6.6 percent. Thus in determining normal visual acuity they are in good agreement. The second-grade pupils showed 72 percent normal vision with Snellen chart, 75 percent with Betts cards, thus showing that as compared with the total group, there were 7 percent fewer individual eyes with less than normal vision, indicating that more children with normal visual acuity were found in the higher grades. The Betts tests in all these instances gave higher

values, thus showing that Snellen charts were more discriminatory in this type of screening test.

SUMMARY

A proper interpretation of a comparative study of the visual acuities obtained by Betts stereoscopic cards and Snellen visual charts is difficult. Different allowances gave a rather marked difference in results. With what was considered a fair allowance the visual acuities of the individual eye were in agreement in only 67 percent of the tests in adults, and 75 percent in children. Thus the Betts visual-acuity tests are not an accurate measure of the visual acuity as compared with the Snellen charts, and especially in individuals with subnormal vision. Age was not a contributing factor in determining the results of this study in either method from the second grade upwards. The Betts tests were not used for children below the second grade; that is, in children younger than about eight years of age. However the illiterate Snellen E chart is satisfactory for children even as young as four years of age. We believe one method is no faster than the other, on the whole. In adults the Betts cards were found to be slightly more discriminatory. As a screening test for determining whether vision was normal, the Snellen charts were only slightly more discriminatory, but the two were in close agreement. Thus neither test has any particular advantage over the other when used to determine whether vision is normal or not. The Betts cards introduced a high degree of suppression and this was only a small factor in the use of Snellen charts.

A CASE OF RHINOSPORIDIUM OF THE CONJUNCTIVA*

WILLIAM BANKS ANDERSON, M.D., AND THOMAS H. BYRNES, M.D.
Durham, North Carolina

Below are presented observations on what is apparently the first reported case of ocular Rhinosporidiosis to occur in North America. Rhinosporidiosis is a disease of the mucous membranes characterized by the formation of peculiar and distinctive polypi. Formation of these polypi is excited by the invasion of the mucous membranes by an organism that has been studied by Ashworth¹ and assigned to the lower fungi (Phycomycetes), suborder Chytridinæ, provisionally placed near the Olpidiaceæ. This particular fungus was originally isolated from a nasal polyp by Guillermo Seever in Buenos Aires in 1896. It was rediscovered by Major O'Kinealy of the Indian Medical Service in 1903. The disease has been described as occurring in man, cattle, and horses. It has been reported from Asia, the Philippine Islands, North and South America, from Africa, and from Europe. It seems probable that the distribution is much wider and that the disease is much more common than one would suppose from the small number of cases that have been reported to date. It is probable that many cases are being overlooked. The mode of infection is not known, but transmission either by dust or water into a previously traumatized area appears to be most probable. Transmission through the handling of infected horses, cattle, pets, and other animals, has been suggested.

Textbook descriptions of the occurrence of this disease in the eye are extremely brief. Duke-Elder² has given only about one page to a discussion of this

very rare infection. He states that all reported cases have come from India. The disease could not be found listed in the index of the "Kurzes Handbuch der Ophthalmologie," although possibly it has been indexed under some other name. McKee³ in a recent textbook devotes about one-fifth page to this condition and indicates that all cases have been reported from India.

The first conjunctival polyp known to be due to the Rhinosporidium was observed and reported by Kirkpatrick⁴ at Madras in 1909. Elliot and Ingram⁵ reported on a conjunctival form in 1912; Tirumurti⁶ in 1915; Wright⁷ in 1922; Duggan⁸ in 1928; Kurup⁹ in 1931; Rao¹⁰ in 1931; and Kaye¹¹ in 1938. Kaye reported from South Africa; all other reports were from India. Recently reports of nasal polypi due to this organism have been reported in Texas.¹² A total of seven cases of nasal polypi due to the Rhinosporidium have been reported in the United States according to the article of Caldwell and Roberts cited below.¹²

We therefore feel justified in calling attention to the invasion of ocular tissue by this organism. We may be reporting only a medical curiosity; on the other hand, the type of lesion is such that it may easily be overlooked in a busy office practice, where many small granuloma of the conjunctiva are being excised and discarded without arousing suspicion as to the etiology of the disease. The disease is probably much more common than has hitherto been supposed, and it is anticipated that if a conscientious search is made of many of the small granulomata that occur on the conjunctiva more of these cases will be found. In view of the difficulty in eradicating

* From the Department of Ophthalmology, Duke University Hospital, and the Pathological Laboratory of the Watts Hospital.

the focus, recognition of the true nature of the disease may assume some practical significance. Sections of our tissue were submitted to Captain DeCoursey and Colonel Ashe of the Army Medical Museum, who concurred in the diagnosis. It was our understanding at the time these slides were submitted that no other cases of ocular Rhinosporidiosis had been registered in the Army Medical Museum.

The infection observed by us occurred in a 12-year-old Negro boy, who presented himself in February, 1938, with a history that for the past 12 months he had noticed a growth on the lower lid of his left eye which, while growing slowly, had now reached the point at which it interfered with closure of the lid. The growth was first observed by the patient in December, 1937. There was no history of previous trauma nor of any similar infection or growth in any of his immediate associates. During the first six years of his life he had lived on a farm in the eastern part of North Carolina, but for the past six years had lived in the city of Durham. He had not been associated in any way with pets, horses, cattle, or agricultural pursuits.

Examination revealed an irregularly lobulated, pinkish-red growth extending or protruding from beneath the lower lid near the external canthus. This growth was definitely pedunculated and attached in the fornix by a broad base. It measured roughly 8 by 4 by 2 mm. There was some lacrimation but no other evidence of irritation. On casual examination it resembled very much the fungoid granulation which one sometimes sees following the curettement of chalazia, and it was first presumed that such was the nature of this lesion. However, due to the fact that it was somewhat more firm, more vascular, and more definitely lobulated than is seen ordinarily in the granulations that occur following such procedures, the

specimen was sent to the Pathological Laboratories after excision. At the time of the removal of the tumor, there was no suspicion of the true nature of the lesion.

The pathologist reported as follows:

The gross specimen is a small, polypoid piece of tissue, 2 by 5 by 8 mm. in size, with a slightly granular outer surface. It is pinkish-white in color, solid but moderately soft, and of uniform consistency, with a few small, yellowish-white areas on the cut surface.

Microscopically, this tissue has a covering of stratified squamous epithelium which is lost in many places where there are superficial ulcerations; and the epithelium dips down to form an occasional cryptlike structure, filled with neutrophilic polynuclear leukocytes. Toward the base, the stroma is of a fairly cellular fibrous tissue, infiltrated with leukocytes, mostly plasma cells. Extending away from this, the stroma has a very scanty cell structure, and the tissue spaces are choked with plasma cells, neutrophilic polynuclears and eosinophiles. There are a few small, compact masses of neutrophilic polymorphonuclear leukocytes, suggesting miliary abscesses. Diffusely scattered through the tissue, for some distance beneath the epithelium, are numerous sporangia of very variable size (figs. 1 and 2), most of which are empty, but some contain a few endospores. Giant cells of the foreign-body type are found about the periphery of a few sporangia. These sporangia have the morphology of *Rhinosporidium seeberi*, and the inflammatory reaction is like that caused by this organism.

The following is the concurring diagnosis of the Army Medical Museum pathologists:

Microscopic: The section shows conjunctival epithelium covering a stroma in which there is a large area of leukocytic and mononuclear exudate around spores that are from about 15 to 120 microns in diameter. With the H & E stain, most of the organisms show a slightly eosinophilic, hyalinlike, refractile capsule about 5 mm. thick. Each capsule surrounds a foamy granular material whose center contains an ovumlike structure with a pseudogranular protoplasm and a slightly eccentrically placed, rounded, basophilic body about one third the diameter of the ovumlike structure (fig. 2). One large ruptured organism with a much thicker capsule is adjacent to recently discharged endospores, each of which would seem to begin a new cycle of enlargement with subsequent multiple endospore formation.

Numerous polymorphonuclear and eosinophilic leukocytes are in the exudate surrounding this ruptured organism. In other places plasma cells are more abundant than polymorphonuclear leukocytes. The reaction extends into the epithelium, which occasionally contains an organism. The surrounding stroma is quite vascular and the endothelial lining cells are somewhat swollen. This lesion both from the morphology of the organism and from the cellular reaction appears to be the result of *Rhinosporidium seeberi*, and as far as I know is the first case of Rhinosporidiosis of the conjunctiva in North America.

Diagnosis: Rhinosporidiosis, conjunctiva.
Report by Captain Elbert DeCoursey.

The cases reported by the Indian observers and the one here reported have the following characteristics in common: The duration of the disease was usually about one year. The lesion was painless, the patient coming in for relief of mechanical obstruction to lid closure. The preauricular gland was not enlarged. The conjunctival polyp averaged in the fresh state 8 by 4 by 4 mm. In the nose the polyp was said to have long, fingerlike processes having semitransparent edges and a band of fibrous tissue running down the middle like the midrib of a leaf. In the conjunctiva the picture was a modification of the nasal form. It was described by one author as having the appearance of a discolored strawberry. Another compared it to a gelatinous "cockscorn." Dilated tortuous conjunctival vessels were observed coursing over the mass in all cases.

Allen and Dave¹³ studied 60 cases of this disease. It occurred 56 times in the nose, and 4 times in the conjunctiva. These authors state that in all cases the polypi presented similar microscopic and histological features. First, the finding of a villous polypus which usually appears wholly or in part composed of granulation tissue that bleeds readily when touched, should arouse suspicion. Then on examination with the loop, one sees a

fleshy growth covered by vascular glistening conjunctiva, with just beneath the surface the typical characteristics of the numerous yellowish-white specks vividly contrasting with the red background. For diagnostic purposes it is suggested that if the growth under investigation is gently squeezed with a pair of light flat forceps and the blades then rubbed into a drop of saline on a slide, a cover slip placed over it, and the preparation examined under low power of the microscope, the characteristic sporangia will be evident. Alternatively, the preparation may be stained by a Romanowski stain, and the spores containing the characteristic spherules will be seen.

Microscopically the polypus proper is said to be covered by an irregularly thick layer of epithelium, which is continued into and forms the lining of numerous branching cryptlike bases extending deeply into the substance of the growth. The stroma in the central portion of the polypus consists of cellular connective tissue which, in some parts, is infiltrated by chronic inflammatory cells. The peripheral part of the stroma, especially that lying subjacent to the epithelium, is largely replaced by chronic inflammatory granulation tissue and pus cells, and some of the cryptlike spaces contain pus. The predominant inflammatory cell is the plasma cell. The mature sporangia tend to find their way through the epithelial layer, and numbers are frequently seen lying free in the crypts and frequently the sporangia are seen in the act of discharging spores.

In a report of this disease in the *British Journal of Ophthalmology*, 1928 volume 12, page 526, Major J. N. Duggan, professor of ophthalmology of the Grant Medical College of Bombay, confirms the microscopic description of Allen and Dave, summarized as follows:

The *Rhinosporidium* affects stratified epithelium; it forms cysts of various sizes, 3 to 4 μ . in diameter, containing 8 to 15 spores and lined by flat epithelium. The cysts burst, discharging spores. After they have gone, the cyst is then invaded by leukocytes. Microscopic sections contain a fair amount of fibrous and

scription of the tissue studied in the case reported by Elliot and Ingram, concurring in essential points with the transcriptions above:

The conjunctival polypus removed from be-



Fig. 1 (Anderson and Byrnes). Showing number and disposition of cysts within polyp ($\times 32$). Compare with figure 3 reproduced from Kirkpatrick (plate 8).

fibrocellular tissue (granulation tissue rich in plasma cells), and typical cysts of *Rhinosporidium*. The cysts are situated in the sub-epithelial layer and are irregular in size, shape, and distribution according to the different stages of the growth. Some contain granular material while others are quite empty.

The following is the pathologist's de-

neath the cutaneous growth: This consists of fibrous and fibrocellular tissue containing a considerable number of typical cysts of *Rhinosporidium kinealyi*. These were of all sizes and were irregularly scattered throughout the tissue. The surface of the polypus was covered with an irregular layer of transitional epithelium; and close to the surface were a large number of cystic spaces full of granular ma-

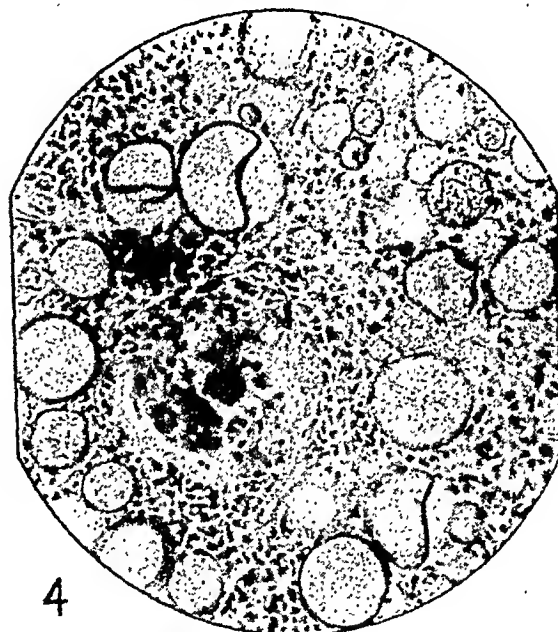
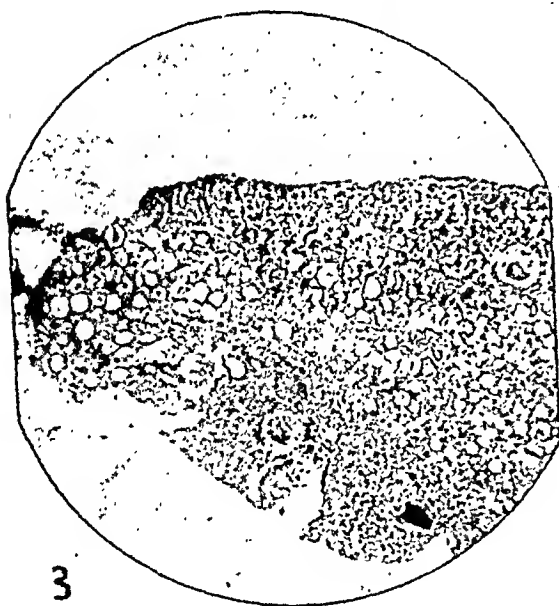
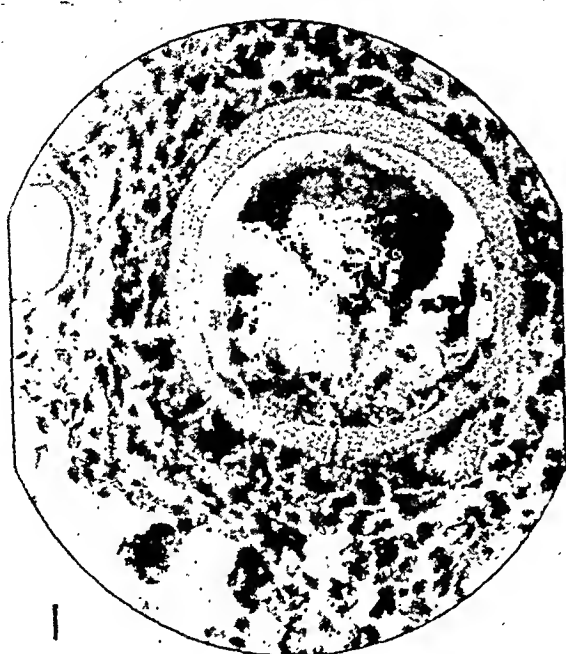


PLATE 8. REPRODUCTIONS FROM ARTICLE BY KIRKPATRICK CITED BY ELLIOT AND INGRAM (OPHTHALMOSCOPE, 1912, V. 10, P. 428).

FIG. 1. CYST EMPTIED OF SPORE MORULAE AND INVADDED BY CONNECTIVE-TISSUE CELLS. GIANT-CELL FORMATIONS. NOTE APPEARANCE SUGGESTIVE OF A PORE IN CYST WALL (ABOUT $\times 700$)

FIG. 2. CYST FROM WHICH SPORE MORULAE ARE ESCAPING INTO SURROUNDING GRANULATION TISSUE. THE CYST WALL IS DEGENERATING (ABOUT $\times 700$)

FIG. 3. SHOWING LARGE NUMBER OF CYSTS ON THE OUTER SURFACE OF GROWTH (ABOUT $\times 100$).

FIG. 4. YOUNG GRANULATION TISSUE CONTAINING CYSTS IN VARIOUS STAGES. A LARGE CYST IS UNDERGOING ORGANIZATION (ABOUT $\times 450$).





Fig. 2 (Anderson and Byrnes). Cysts in various stages of development. Compare with figure 4 reproduced from Kirkpatrick (plate 8). U. S. Army Medical Museum negative number 68470.

terial. These large cysts were almost all lined by an irregular layer of epithelium derived from the conjunctival epithelium, and some contained degenerate leukocytes in their granular contents. Almost all the parasitic cysts are more or less distorted and degenerate.

Almost all the parasitic cysts were more or less distorted and degenerate.

The treatment in our case consisted of simple excision. This was done in February, 1938, and to date there has been no recurrence. Excision is the method recommended by the Indian authors. In general there is said to be a strong tendency toward recurrence, particularly when the growth has not been excised with sufficiently wide margin, and when the polyp has been crushed in the manipulation incident to its removal. The treatment of multiple growths is said to be very unsatisfactory. Allen and Dave recommend excision, application of electric cautery, and the injection of 2 to 4 grams of neostiboson (Bayer) in 0.3-gm. doses intravenously.

Figures 1, 2, 3, and 4, of plate 8 are microphotographs taken from a report by Major Kirkpatrick, professor of pathology of the Medical College of Madras. They

are inserted for comparison with our microphotographs (figs. 4, 3, 2, 1) which are approximately identical magnifications. The titles of Professor Kirkpatrick's illustrations are self-explanatory.

Figure 4 in our series is a large cyst with highly refractile wall filled with spore morulae of varying size.

Figure 2 shows cysts of varying stages of maturity. Our figure 2 is to be com-

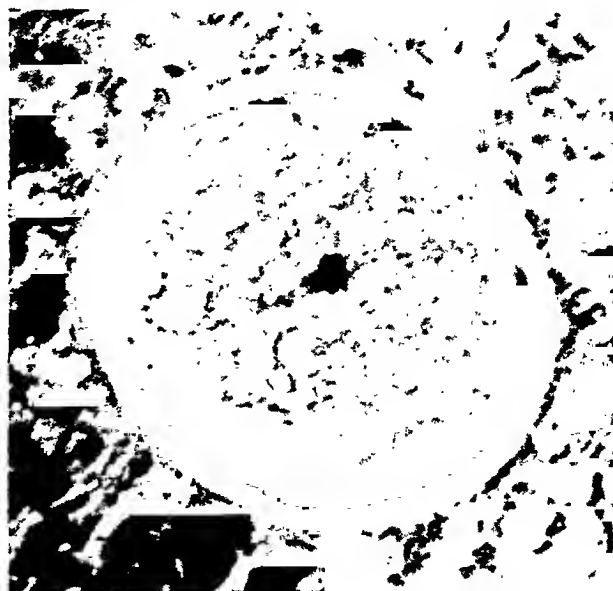


Fig. 3. (Anderson and Byrnes). Showing contents of cyst. U. S. Army Medical Museum negative number 68472.

pared with figure 4 (plate 8) of Dr. Kirkpatrick's series.

Figure 1 of our series shows a relative scarcity of cysts in contrast to those

with the *Rhinosporidium* reported in India. Cases of nasal polypi due to this condition have been reported in this country. So far as we can determine, no such



Fig. 4 (Anderson and Byrnes). Cyst with highly refractile wall containing spore morulae in varying stages of development ($\times 750$). Compare with figures 1 and 2 reproduced from Kirkpatrick (plate 8).

reported in Professor Kirkpatrick's series, figure 3 (plate 8).

Comment. Almost by accident we have discovered a polyp of the conjunctiva which we have demonstrated to be due to a fungus. We believe this to be identical

infection of the ocular tissue has occurred. It is hoped that a search will be stimulated for further cases, and that by culture our impression of the identity of the organism will be confirmed.

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RHINOSPORIDIOSIS

A CASE REPORT

EDWARD W. GRIFFEY, M.D.

Houston, Texas

E. K., a normally developed white boy, aged 10 years, presented himself on December 14, 1938, with a small strawberry-colored mass attached to the caruncle of the right eye. The child lives on a farm and helps take care of horses and cows. There are several children in the family but no others are affected.

The mass was nodular and solid, encapsulated, roughly pear-shaped, 12 by 10 by 6 mm. in size, and was attached to the upper edge of the caruncle and scleral conjunctiva by a thin stalk 5 to 8 mm. long. The mass was lying partly in the palpebral fissure so that the lids could not be completely closed at the inner canthus.

The mass was excised at the base of the pedicle; one suture was required to close the wound. The patient was last seen on January 14, 1939, and showed no sign of recurrence.

The specimen was sent to the Army Medical Museum where it was examined and diagnosed under Accession No. 60735 by Dr. Elbert De Coursey, who returned the following report:

Gross: The specimen was a white dome-shaped mass 9 by 8 by 4 mm. which at the peak showed a dark cyst 1 mm. in diameter. The surface was opaque and granular, the granules being opaque and slightly cream colored. On section the surface presented tiny indistinct granules. Opaque areas and a few reddish-brown dots were seen deep in the grayish-white, somewhat translucent ground work.

Microscopic: The mass presents a chronic inflammatory reaction around spores that are numerous in the subepithelial stroma and that are also present in

the surface epithelium. The spores are so numerous that several low-power fields show as many as 40 encapsulated organisms that vary in size from about 30 to 200 microns in diameter. With hematoxylin-eosin staining, most of the organisms show a thick amphophilic capsule surrounding a foamy granular material whose center contains an ovumlike structure with a distinct limiting membrane, a pseudogranular protoplasm, and a slight eccentrically placed rounded basophilic body about one third the diameter of the ovumlike structure. The larger organisms contain hundreds of blue-stained endospores filling the entire interior. The capsules of the large, mature organisms are thicker and somewhat refractile. The capsules stain blue with the Masson stain, and with Giemsa stain they stain red except in the largest ones, which stain blue. Within and around a recently ruptured organism there are infiltrating leucocytes. Each escaping endospore would seem to begin a new cycle of enlargement with multiple endospore formation.

The chronic inflammatory tissue is characterized by diffuse edema and an exudate composed chiefly of plasma cells mixed with lymphocytes, polymorphonuclear leucocytes and a few large mononuclears. Around the medium-sized and small encapsulated spores cellular reaction is not intensified, but since the cells are more numerous around groups of small forms it would seem that the rupture of mature organisms incites the cellular activity. The tissue is quite vascular. The vascular endothelium is not particularly swollen. The 1-mm., dark cyst appears over an ulcerated area and con-

tains one very large body filled with endospores, a recently ruptured body, and numerous free encapsulated endospores, some as small as 15 microns in diameter and some of which show on the surface. Infiltrating leucocytes and necrotic tissue are also present here. The squamous epithelium is greatly thinned out over much of the surface but in places it is thickened and infiltrated with leucocytes.*

* EDITOR'S NOTE: The reader is referred to the illustrations in the preceding article on the same subject by Anderson and Byrnes.

Diagnosis: Rhinosporidiosis, scleral conjunctiva.

Comment: In the seven reported (Caldwell and Roberts, Jour. Amer. Med. Assoc., 1938, v. 110, May 14, p. 1641) cases of this disease in North America all of the lesions have been in the nose. The Registry has two slides from a case that occurred early this year in North Carolina. The material in this instance is so well preserved and your history is of such interest that in addition to the rarity of the lesion we think that this case merits publication.

THE EFFECT OF TARTAR EMETIC ON THE COURSE OF TRACHOMA*

SECOND REPORT

L. A. JULIANELLE, PH.D.

Saint Louis

J. F. LANE, M.D.

Albuquerque, New Mexico

AND

W. P. WHITTED, M.D.

Gallup, New Mexico

In a preliminary communication¹ from this laboratory, a report was made on the experimental treatment of trachoma by intravenous administration of tartar emetic.** While the data suggested that the drug might have a potential value in certain phases of this disease (for example, in corneal complications), it

was not possible at that time to define the extent of its usefulness. Since then, however, the occasion has presented itself to resume the study of this treatment both in white patients and in Indians on the Navaho reservation,[†] and it is now desirable to place the results on record.

*From the Department of Ophthalmology, Washington University School of Medicine, and the U. S. Indian Service. This work was conducted under a grant (to L. A. J.) from the Commonwealth Fund of New York.

** Since the preceding report, a supplementary communication on the use of tartar emetic in trachoma has been published by Derkač, V., Klin. Monatsbl. Augenheilk., 1938, v. 101, p. 418. It has also come to our attention that this drug was perhaps first used in trachoma by J. Louwerier, Geneesk. Tijdschr. Nederl.-Indie, 1923, v. 3, p. 63.

† The opportunity for conducting this study was made possible by the efforts of Drs. J. G. Townsend, W. W. Peter, and Polk Richards, of the U. S. Indian Service. In addition, we acknowledge gratefully the coöperation of Dr. Paul Vietzke of the Indian Service Hospital at Fort Defiance, Arizona, Dr. Leo Schnur of the Hospital at Fort Wingate, New Mexico, Mother Berchmans and Sister De Ricci of St. Michael's School in Arizona for extending the facilities and privileges of their respective institutions, and to nurses G. Engelman, M. Alexander, and R. Moldenhauer of the Indian Service.

METHODS OF STUDY

The patients under observation in this study have been 22 in number, 18 of whom were treated on the Navaho reservation, while 4 came to the Washington University Medical Clinics. In 6 of the 18 Indian patients the disease was limited almost entirely to the lids, the reaction occurring in the cornea being only slight and insufficient to cause significant if any visual disturbance. These individuals were selected intentionally in order to determine the effect of tartar emetic on the conjunctival manifestations, since it was suspected from the previous study that disease of the lids did not respond to this treatment. The remaining 12 patients were in the advanced stages of the disease, which was characterized by marked involvement of the cornea with serious visual impairment, while the lids were predominantly thickened and scarred, with little or no clinical activity. The patients treated at the University Clinic were also of the advanced type. It will therefore be convenient to discuss later the effect of the treatment representative of the two groups (that is, trachoma, essentially of the lids or of the cornea).

Except for irrigations of saline and boric-acid mixtures in the morning, the treatment consisted almost entirely of injections of tartar emetic. As will be brought out later, atropine was used when indicated in the case of corneal ulcers. While the schedule of injections was necessarily varied, depending upon different conditions, the following proved to be satisfactory: 1 ampoule† (5 c.c. or 0.05 gm.) daily for the first six days; 2 ampoules three times a week for two weeks; 2 ampoules a week for two more weeks.

† Tartar emetic is obtained from various commercial houses, as sterile, 1-percent solution in ampoules of 5 c.c.

In following the progress of the treatment, both clinical observations and visual acuity were recorded on each patient once a week. It was intended to study the effect on the epithelial-cell inclusions, but, as it happened, in only one patient were these bodies found originally in sufficient numbers to make such a study significant. A careful check was kept of any toxic symptoms referable to the tartar emetic.

RESULTS OF THE TREATMENT

Effect on the Conjunctival Disease. As already stated, six patients, all Navahos, were selected to determine the effect of tartar emetic on trachoma of the lid. As will be seen in table 1, the disease was characterized by only a minor degree of corneal involvement, and the visual acuity in each was within normal variations, indicating in another way the comparative freedom of the cornea from disease. These patients were under treatment over a period of 23 to 28 days, and they received from 61 c.c. (0.61 gm.) to 88 c.c. (0.88 gm.) of the drug. There is no necessity for elaborating upon the results observed in this group. A study of the accompanying table indicates clearly enough that the treatment had little effect on the trachoma of these patients. The conjunctival and corneal lesions remained approximately the same, and visual acuity, being as good as it was in the beginning, could hardly be expected to improve. The evidence suggests, therefore, that in early trachoma complicated by slight corneal participation, tartar emetic has little, if any ameliorative effect on the conjunctival disease. The most that can be said for the treatment in this case is that the symptoms did not progress in the interim. It seems, therefore, that for this variety of trachoma, other methods of therapy are indicated.

TABLE 1

EFFECT OF TARTAR EMETIC ON ESSENTIALLY CONJUNCTIVAL TRACHOMA

Patient	Dosage	Toxic Symp-toms	Effect of Drug on			
			Vision		Lids	Corneae
			R	L		
T ₁	86 c.c. (.86 gm.)	Cough	20/30 20/20	20/20 20/20	Papillary with scarring. No change.	Slight pannus. No change.
T ₂	88 c.c. (.88 gm.)	Cough	20/20 20/20	20/20 20/50	Follicular and papillary. No change.	Slight pannus. No change.
T ₃	61 c.c. (.61 gm.)	None	20/40 20/20	20/20 20/20	Almost complete scarring. No change.	Slight pannus. No change.
T ₄	61 c.c. (.61 gm.)	None	20/40 20/20	20/20 20/20	Follicular and papillary with some scarring. No change.	Slight pannus. No change.
T ₁₃	68 c.c. (.68 gm.)	None	20/30 20/30	20/70 20/70	Slight papillary activity all lids. No change.	Slight pannus. No change.
T ₁₄	73 c.c. (.73 gm.)	Cough	20/20 20/20	20/20 20/20	Papillary hypertrophy. No change.	Slight pannus. No change.

The double notations under effects of the drug represent the conditions observed before and after treatment.

R indicates right, and L left eye.

Effect on the Corneal Disease. The individuals selected for this part of the study were all patients with long-standing disease. For convenience, the data associated with them have been tabulated and brought together in table 2.

Analysis of the information reveals that the disease in the lids was markedly advanced, scarring being present in varying degrees, even to the point of completion, where the lids were greatly thickened, assuming the more or less cardboardlike appearance characteristic of this stage. Clinical activity was absent in the majority of the patients, and where infection was active it was only moderate or slight.

The corneal disease, on the other hand, was disproportionately exaggerated; in 9 patients (T_{7, 9} to 11, 15, 18, 20 to 22) scarring had already occurred; pannus was heavy and generalized in all; and in 3 (T_{20, 21, 22}) active ulcers were present at the beginning of treatment. Examination of visual acuity before treatment demon-

strated differing degrees of impairment, restricted to counting of fingers in 1 (T₁₀), light perception only in 2 (T_{15, 20}), and even total blindness in 2 (T_{8, 11}). In every instance, however, loss of vision was obviously a predominant characteristic of this group. There can be no doubt, therefore, that corneal involvement in this series of patients was extensive to a stage where its control is usually considered difficult.

The treatment varied in the different patients from 24 to 36 days, and the quantity of drug administered from 63 c.c. (0.63 gm.) to 170 c.c. (1.7 gm.). Unfortunately, tartar emetic proved to be abnormally toxic in the Indians, as will be brought out later, so that treatment was curtailed either by cessation or by reduction of the scheduled dosages. In spite of this curtailment, however, it will be seen from the data in table 2 that among the Navahos tartar emetic effected varying degrees of improvement in all the patients treated.

TABLE 2

EFFECT OF TARTAR EMETIC ON ESSENTIALLY CORNEAL TRACHOMA

Pa- tient	Dosage	Toxic Symp- toms	Effect of Drug on			
			Vision		Lids	Corneae
			R	L		
T ₅	106 c.c. (1.06 gm.)	None	20/200 20/70	6/200 20/70	Heavy scarring; very little activity. No change.	Heavy, general pannus; marked clouding. Pannus marked improvement; corneae clear and vessels smaller.
T ₆	68 c.c. (.68 gm.)	Muscular stiffness calves & thighs	15/100 20/65	15/100 20/50	Slight hyperemia, marked scarring. No change.	Slight pannus, moderate clouding. Pannus improved, corneae clear.
T ₇	102 c.c. (1.02 gm.)	None	5/200 Light percep.	2/200 12/200	Lids scarred; no activity. No change.	Protrusion rt. corneae; both clouded with marked general pannus and scarring. Improvement both corneae.
T ₈	63 c.c. (.63 gm.)	Cough & vomiting	Blind Light percep.	20/20 20/30	Lids arrested. No change.	Marked general pannus R. moderate pannus L. R, definite improvement; L, barely visible pannus and complete clearing.
T ₉	108 c.c. (1.08 gm.)	None	4/200 20/100	20/70 20/65	Slight if any activity. No change.	Clouding with scarring both corneae; heavy general pannus. Both corneae much clearer, vessels still present.
T ₁₀	80 c.c. (.8 gm.)	Cough	9/200 20/60	9/200 20/70	Scarring with considerable activity. No change.	Marked clouding, marked general pannus, with scarring. Definite improvement both eyes, but not arrested.
T ₁₁	87 c.c. (.87 gm.)	Cough	9/200 20/125	Blind Blind	Little if any activity. No change.	Marked clouding, marked general pannus with scarring, R. Corneae clearer, vessels still marked.
T ₁₂	98 c.c. (.98 gm.)	None	7/200 20/200	7/200 20/90	Entropion both upper lids; scarring with no activity. No change.	Marked clouding, marked general pannus. Marked improvement R, slight improvement L.
T ₁₅	90 c.c. (.9 gm.)	Cough	Light perception 7/200	Light perception 12/200	Entropion both lower lids and R upper; hypertrophied adhesions & scar tissue, no activity. No change.	Heavy clouding, heavy generalized pannus with scarring. Corneae clear, but vessels about the same.
T ₁₈	101 c.c. (1.01 gm.)	None	20/200 14/200	20/200 20/150	Marked scarring interspersed with small areas of activity. No change.	Heavy pannus R and L with clouded corneae. Corneae clear, vessels thinner and fewer in number.

TABLE 2 (Continued)

EFFECT OF TARTAR EMETIC ON ESSENTIALLY CORNEAL TRACHOMA

Patient	Dosage	Toxic Symp-toms	Effect of Drug on			
			Vision		Lids	Corneae
			R	L		
T ₁₇	Left hospital before treatments progressed far enough.		20/50	20/200	Complete scarring; no activity.	R, slight pannus, clear corneae with old scarring; L, heavy generalized pannus, heavy clouding with scarring.
T ₁₈	95 c.c. (.95 gm.)	None	20/30	20/70	No change.	R, improvement; L, cornea clear, many vessels absorbed, but some still remain.
W. U. Clinic:						
T ₁₉	160 c.c. (1.6 gm.)	Muscular stiffness, arm vessels thrombosed	C.F. at 2 ft. 6/20-1	C.F. at 3 ft. 6/20	Marked papillary hypertrophy. No change.	Heavy generalized pannus, marked clouding. Clear corneae with partial absorption of pannus; disease arrested.
T ₂₀	90 c.c. (.9 gm.)	Muscular stiffness and pain	Light percep.	6/20	Scarring & thickening; little activity.	L, suggestive, old pannus, inactive pterygium; R, general clouding, heavy general pannus, ulcer. Asymptomatic.
T ₂₁	90 c.c. (.9 gm.)	None	C.F. at 1 ft. 2/60	6/20-1 4/60	No change. Scarring, moderate activity.	Clouding, heavy generalized pannus, scarring, with ulcer R. Asymptomatic.
T ₂₂	120 c.c. (1.2 gm.)	Joint pains	6/20	6/30	Asymptomatic.	R, negative; L, opaque, heavy generalized pannus, ulcer, scarring.
			6/10	Light percep.	Excessive purulent discharge, marked injection, papillary hypertrophy.	
			6/30-1	6/7.5	Asymptomatic.	Asymptomatic.

The double notations under effects of the drug represent the conditions observed before and after treatment.

R indicates right, and L left, eye; C.F. = counts fingers.

As might be anticipated, both because of the foregoing observations and because the amount of conjunctival activity was slight, if present at all, there was no noteworthy change in the lids following the course of treatment. Concerning the corneal disease: 1 patient (T₁₇) had to leave the hospital, before sufficient treatment was given, because of epileptic seizures; 6 patients (T_{5, 8, 19 to 22}) became asymptomatic following administration of tartar emetic; 2 patients (T_{6, 10}) were definitely improved but the dis-

ease was not arrested; and in 7 (T_{7, 9, 11, 12, 15, 16, 18}), improvement was especially marked, but it was difficult to state whether the infection was actually arrested. In the 3 patients with active ulcers (T_{20, 21, 22}), healing was effected with the aid of atropine. In this connection it should be pointed out that patient T₆ (a syphilitic with possibly luetic iritis) developed two corneal ulcers during observation. Treatment was continued as usual and atropine was applied locally. There was complete healing of

the ulcers within 10 days under these conditions. There was marked clearing of the corneas to complete transparency in the different patients, with more or less resorption of capillaries, although the larger vessels were still discernible in each case. Scarring of the cornea was not affected.

Concurrently with corneal improvement there was a gain in visual acuity; in some patients this was particularly marked (see T₅, 6, 10, 15, 19), in the others not so marked but very definite. It is interesting to note that the greater restorations of vision occurred in the patients either without or with minor corneal scarring. It should be obvious, of course, that where loss in vision is due to permanent histological change of the cornea, acuity remains deficient to that extent. It is felt that this observation on vision indicates better than any other way the amelioration observed in all the corneal examples of trachoma, since it alone provides a method for measuring objectively the effect of the treatment.

TOXIC REACTION ASCRIBABLE TO THE TREATMENT

In the former report¹ it was stated that of the various toxic reactions described as due to tartar emetic the only manifestation observed while treating patients with trachoma was stiffness of the muscles, particularly those in the regions of the lower leg and the back between the scapulae. While cough and even vomiting are described in textbooks as additional toxic symptoms, these were never observed in the white patients treated in Missouri, in Kentucky, and in the University Clinic. A careful study has been made of the toxic reactions appearing in the present groups of patients, and these are given in tables 1 and 2.

Analyzing the data, it will be seen that of the 22 patients studied, 10 completed treatment without clinical evidence of

toxic reactions ascribable to tartar emetic. Of the remaining 12, 7 (all Indians) were afflicted with paroxysms of violent coughing. § This came on within a few minutes after the injection, it lasted from 10 to 20 minutes and was alarming, when first encountered, to both patient and attendant. After the paroxysm had once subsided, there appeared to be no further disturbance, nor any aftereffect. In one of the individuals the coughing was complicated by vomiting. As a result of this reaction it became necessary to reduce appreciably, or even eliminate, subsequent injections. Three other patients suffered muscular stiffness and pain, one of whom ended the course of treatment with the arm vessels used for injections distinctly thrombosed. The last patient complained of articular pains which necessitated from then on a reduction in the amount of tartar emetic administered.

It is seen, therefore, that more than half the patients tolerated the drug with different degrees of disturbance and discomfort. Despite the toxicity, however, it remained possible to continue treatment in most patients by either decreasing the dosage or spacing the injections farther apart.

DISCUSSION

The present communication records the resumption of experiments on the treatment of trachoma with tartar emetic. In order to appraise the data fairly, it is necessary to consider the disease as, on the one hand, essentially, a conjunctival, and, on the other hand, essentially a corneal process. On the basis of this classification, it appears that tartar emetic is ineffectual in eradicating the conjunctival disease. This is in agreement with

§ In a personal communication, Dr. Dwight H. Trowbridge, of Fresno, California, reported a similar experience among white patients at one of his clinics.

previous studies, when it was suggested that in heavy conjunctival trachoma the drug be used as a supplementary procedure to grattage. In fact it was pointed out at that time that the most striking results with tartar emetic were observed when injections were given following this operation. The procedure adopted was one ampoule (.05 gm.) a day for four days including the day of operation and finally two ampoules on the fifth day. In cases of advanced corneal disease, this method of treatment causes definite improvement in most cases, even to rendering the condition asymptomatic. This improvement is determinable by recovery of vision as well as by diminution or disappearance of the clinical signs and symptoms. Why tartar emetic should act with a measure of success in this stage of trachoma and not in the conjunctival phase cannot be answered from the data available.

The toxicity of tartar emetic appears to have been greater in the present than in the previous study. Whether Navaho Indians are more idiosyncratic to the drug, or whether the current patients formed a more representative group is not clear. In any case, it does not seem necessary to forego further treatment because of the possible toxic reactions to the drug. Toxicity may be controlled by reducing the dosages, spreading injections over longer intervals, and introducing the drug very slowly.

If the evidence from the combined studies on tartar emetic can be interpreted correctly, it would follow that the drug may be used with benefit as a medication supplementary to grattage, and in advanced, scarred cases of trachoma with extensive corneal complications, especially those refractory to the

older methods of therapy. It seems wiser, therefore, to utilize tartar emetic only in these instances, rather than attempt to employ it for any and every patient with trachoma.

CONCLUSIONS

1. Tartar emetic used as described in the treatment of trachoma has little effect when the disease is essentially conjunctival.

2. When, however, conjunctival hyperplasia is sufficiently extensive to warrant grattage, tartar emetic administered according to the short schedule is a helpful, supplementary procedure.

3. Measured by clinical improvement and gain in visual acuity, the drug has a definite, beneficial effect on corneal trachoma, even rendering the disease asymptomatic.

4. In more than half the patients observed in this study, tartar emetic was patently toxic, inducing coughing, muscular stiffness and soreness, and in one case articular pain, in another vomiting, and in still another thrombosed veins.

ADDENDUM

Since the time of writing, five additional patients were treated with tartar emetic on the Navaho reservation. All manifested extensive corneal trachoma, and are to be classified with the second group reported above. They received from 110 c.c. (1.1 gm.) to 170 c.c. (1.7 gm.) of the drug. In three patients no toxic reactions were observed, while in one there was slight coughing, and in the other the cough was accompanied by muscular stiffness and pain. All the patients were definitely improved following the course of treatment, both the clinical condition and gain in visual acuity testifying to the improvement.

REFERENCE

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NOTES, CASES, INSTRUMENTS

KRUKENBERG SPINDLES IN A PATIENT WITH INTERSTITIAL KERATITIS*

MORRIS H. PINCUS, M.D.
Brooklyn, New York

The nature of and the causative factors that enter into the formation of the Krukenberg's spindle have been a subject of divergent views since Krukenberg¹ first described this phenomenon. Some observers believe that it is congenital in origin; others claim that it is an acquired condition that usually follows intraocular inflammations.

Krukenberg spindles have never been observed in an individual during the first decade of life and only one case² has thus far been reported in the second decade of life.

This condition has been observed associated with various diseases of the eye, but it has also been found in otherwise apparently normal eyes. No case has been reported in which the Krukenberg spindles had been observed in the course of or following an attack of interstitial keratitis. The case which I am presenting is of interest in that it occurred in an individual who apparently had been subject to many exacerbations of interstitial keratitis and, although she had been a subject of numerous previous examinations, its existence had not been mentioned until her last admission to the clinic.

Case Report. I. DeC., a white woman, aged 26 years, of Italian extraction, came to the ophthalmological clinic of the Long Island College Hospital on May 28, 1938, complaining that she had headaches

when reading or sewing. Glasses were of no help to her. She stated that her discomfort was always felt in the left supra-orbital region and that it subsided after periods of rest. There was no history of nausea or vomiting. Her past history revealed that at the age of three years, she was taken to an eye hospital, where her mother was told that the child had "badly inflamed eyes." At the age of nine years, glasses were prescribed. She has worn glasses ever since. She had pneumonia at 17. She is married and has three children, all of whom are living and well. There were no miscarriages nor stillbirths. Her present complaint dates back two months. Six weeks ago, she went to an ophthalmological hospital seeking relief from these headaches. There, she had a blood Wassermann test. It was reported as two plus. After three anti-syphilitic injections, the blood Wassermann reaction became negative.

The physical examination revealed a well-nourished white female with chronically infected and hypertrophied tonsils. Her heart and lungs were normal. The blood pressure was 120/80. The urine was normal. Her blood Wassermann was negative. The otolaryngoscopic division recommended tonsillectomy.

Both upper lids were slightly ptosed. The lid actions appeared slightly impaired on upward gaze. The cornea of the right eye had a central nebulous opacity and the cornea of the left eye a more dense opacity. Both were vascularized. The anterior chambers were normal in depth. The pupils appeared to react to light, direct and consensual. The media were hazy, due to the corneal opacity in each eye.

The disc in the right eye was seen, but

* From the Department of Ophthalmology, Long Island College Hospital.

appeared indistinct due to the corneal opacity. There was a small temporal myopic conus. The macula was not seen, nor could accurate details of the remainder of the fundus be discerned. It was the impression that nothing more than thinning of the retina existed peripherally.

The fundus of the left eye, due to the corneal opacity, was more obscured. It was the impression that no pathological change existed.

The extraocular muscle movements were normal.

Refraction estimated under cycloplegia with homatropine was: O.D. -4.00 D. sph., vision = $6/21$; O.S. -3.00 D. sph., ≈ -2.00 D. cyl. ax. 180° , vision = $6/21$.

The slitlamp examination of the left eye revealed a dense interstitial infiltration of the cornea. There were superficial as well as deep blood vessels throughout the cornea. Circulation of the blood cells was visible in the more superficially placed vessels. A superficial dull brown line extended obliquely from about the 8-o'clock position, to the middle of the cornea. On the endothelial surface of the cornea, by reflected light, there could be seen a longitudinal fusiform dustlike brownish pigment deposit opposite the pupillary opening. It was about 1 mm. wide and 4 mm. long. It was rather sharply demarcated, but a few of the same dustlike particles were scattered about on either side. The anterior chamber was normal in depth. No aqueous flare was present. The iris was brown in color, but, scattered throughout the crypts, were the same fine brownish particles that were noted on the endothelial surface of the cornea.

The slitlamp examination of the right eye showed that the cornea was less densely infiltrated and that the major portion of the interstitial infiltration oc-

cupied the central area of the cornea. The superficial and deeper blood vessels were distributed in a manner similar to that in the left eye. In the region of Bowman's membrane, a fairly heavy linear brown line extended across the cornea but was lost in the opacity of the central portion of the cornea. On the endothelial surface of the cornea, arranged in a vertical fusiform manner, was a deposit of fine brown pigmented particles. Its widest portion was about $1\frac{1}{2}$ mm., opposite the pupillary opening, and it was about 5 mm. in length. On either side of it, scattered pigment particles were seen. The anterior chamber was normal in depth. No aqueous flare was present. The color of the iris was brown. Scattered over the crypts were the same pigmented particles.

Comment. It is of interest to note that this condition occurs more frequently in the female and is often associated with myopia. It does not seem to affect its possessors subjectively, inasmuch as the presence of the spindle does not affect vision. Neither individuals with hypermetropic refractive errors nor those with emmetropic eyes are immune. Krukenberg spindles have been found associated with these refractive errors.

The patient here described has been a frequent subject of observation for the ophthalmologist. Since her early childhood she has suffered from an eye affliction; and yet no note was ever made of the presence of these peculiar spindle pigmentations. When she came to the clinic, she was suffering from the after-effects of an interstitial keratitis which in her case may or may not be related to syphilis. Her blood Wassermann reaction was reported as two plus only once, and with only three intravenous treatments has since become negative serologically.

This case resembles in some degree the one mentioned by Friedenwald² who ob-

served the formation of the spindles in a patient with syphilitic uveitis, and who saw them disappear when adequate treatment resolved the process. In the latter respect this case differs from his. The evidence in this case points to the conclusion that the Krukenberg spindles were formed in the inflammatory process to

which the cornea was subjected. This instance may add a little weight in the scale, on the side of those who believe that Krukenberg spindles are not congenital in origin but rather the product of some infection or some disturbance occurring in the eye.

881 Washington Avenue.

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TRANSIENT MYOPIA FROM SULFANILAMIDE

WATSON W. GALEY, M.D.
Bloomington, Illinois

Mrs. H., white, female, aged 34 years, was referred by Dr. O. H. Ball for an ophthalmological examination on December 19, 1938. Two days previously, the patient had consulted Dr. Ball for a condition that he had diagnosed as a mild streptococcus infection of the throat. He had prescribed sulfanilamide 7 gr. to be taken with an equal amount of bicarbonate of soda, *q.i.d.* After taking 21 gr. on the first day, the patient awakened the next morning to find that her distance vision was extremely blurred. By noon of that same day it was difficult for her to recognize members of her own family at a distance of 10 to 15 ft. It was possible, however, for her to read newspaper type without difficulty. In addition to this symptom, she experienced nausea and some slight degree of cyanosis.

Ophthalmological examination on December 19, 1938, revealed vision of 15/200 in the right eye and 20/200 in the left. With a -3.25 D. sph. before the right eye she could read 20/20 and with

a -3.00 D. sph. before the left eye she could read 20/20. Her pupils were of normal size and reacted readily to light and accommodation. The tension in each eye was 34 mm. with a McLean tonometer. The visual fields were normal in area with no enlargement of the blind spot and no evidences of scotomata. Examination of the fundi was negative. The urine was negative and the blood sugar was 105 mg. per 100 c.c. A differential blood count was not made.

On the morning of December 20, 1938, examination revealed that a -2.50 D. sph. before each eye gave normal vision. On the following day her vision was normal in each eye without the aid of lenses and she was able to read Jaeger 1 at 14 inches with ease.

Subsequent examinations on December 28, 1938, and January 11, 1939, revealed no findings of any significance. Her vision remained normal and no changes were found in the retinae, not even the slightest evidence of edema. It was assumed that this had been an artificial myopia induced by an edema of the crystalline lenses.

The literature has been scanned for the purpose of finding a similar case and in only one instance was a report encoun-

tered that seemed to parallel this one, a case report published in the Illinois State Medical Journal, issue of April, 1939, by Dr. M. S. Spellberg of Chicago, in which Dr. A. H. Herman attributed a transient myopia to edema of the retina.

Subsequent examinations at 8 weeks and 12 weeks were made. Refraction under homatropine and paredrine was performed. The fundi were normal and the refraction was emmetropic.

PARINAUD'S OCULOGLANDULAR SYNDROME*

REPORT OF THREE CASES

FRANCIS H. MCGOVERN, M.D.
Danville, Virginia

This syndrome, first described by Parinaud in 1889, is characterized by a unilateral conjunctival lesion with an associated regional adenopathy. Unfamiliarity of this syndrome by physicians other than ophthalmologists has led to mistaken diagnosis, especially in cases with submaxillary, preauricular, or cervical lymphadenitis—little attention being paid to the palpebral pathology. Last year I had occasion to see two cases of this syndrome within a week, and recently a third case, in which the diagnosis of the adenopathy varied from mumps to lymphosarcoma.

The syndrome is uncommon but not at all rare. Most authorities now agree that a number of etiological factors are involved; that there is no single cause. The combination of a conjunctival lesion with regional adenopathy is found in oculoglandular tularemia, tuberculosis of the conjunctiva, conjunctival syphilis, the leptothrix conjunctivitis of Verhoeff,**

and several other less common conditions of debatable etiology. On occasion, because of insufficient knowledge or faulty technique, or in spite of most careful bacteriological and serological examination, a causative organism cannot or is not identified.

Certain of the acute purulent and inclusion lid and conjunctival diseases are associated with regional adenopathy, but the lymphadenitis is transient, inconstant, and of minor importance. In the cases here reported the adenopathy was of paramount interest, the primary ocular lesion receiving little attention. It is surprising how a somewhat insignificant conjunctival lesion can cause such massive enlargement of the cervical lymph nodes. The glandular swelling and the ocular symptoms are usually synchronous. The constitutional symptoms vary from severe, as in oculoglandular tularemia, to slight or absent, as in leptothrix conjunctivitis or tuberculosis of the conjunctiva. The appearance of the conjunctival lesion may suggest the causative organism, but some laboratory procedure is always necessary to verify the diagnosis.

CASE REPORTS

The first case is represented by a young physician who suddenly became sick with fever and malaise and tender enlargement of the right submaxillary and cervical lymph nodes. I first saw him 20 days after the onset. He gave a history of having performed an autopsy, six days before his illness began, on a pig suspected of being poisoned. He consulted several physicians; the diagnosis varied from mumps to lymphosarcoma. Little attention was paid to the palpebral swelling on the right side. He was very much concerned about the correct diagnosis and prognosis.

He was admitted to the Memorial Hospital on May 3, 1938. The upper lid of the

* Read before the Virginia Society of Ophthalmology and Otolaryngology, at Roanoke, Virginia, May 6, 1939.

** Verhoeff, F. H., and King, M. J. Arch. of Ophth., 1933, v. 9, Dec., pp. 701-714.

right eye was red and swollen; the upper palpebral conjunctiva presented a small raised yellowish plaque superficially ulcerated. The globe was entirely normal. The right submaxillary and preauricular lymph nodes were quite swollen and tender to palpation. Physical examination was otherwise negative. The temperature on admission was 101.8°F. and remained between normal and 100 degrees until the evacuation of a submaxillary abscess 10 days later. The white blood cell count was elevated to 13,000 with a preponderance of polymorphonuclear leucocytes and from one to four percent eosinophiles. The routine agglutinations for typhoid, tularemia, and undulant fever were negative on two occasions. Nothing was found on conjunctival smear and culture. Culture of the pus from the submaxillary abscess showed *Staphylococcus albus*. A guinea pig was inoculated subconjunctivally and intraperitoneally with material from conjunctival scrapings and pus from the abscess, with no apparent result. An autopsy of the guinea pig a month later showed no pathology. The culture technique described by Wright* produced no growth of the leptothrix.

The clinical course and clinical appearance corresponded closely to Parinaud's conjunctivitis of animal origin. In spite of fairly complete examination, no etiological agent could be identified. Due to circumstances we did not excise conjunctival tissue and use the special staining methods of Verhoeff to demonstrate the leptothrix. The culture and isolation of this organism are apparently quite difficult. However, the rather severe constitutional reaction and the appearance of the conjunctival lesion did not coincide with the description of leptothrix conjunctivitis. When the prognosis was given the

patient was relieved and convalescence proceeded to complete recovery.

The second case was that of a young colored boy, aged 12 years. He presented a red swollen upper lid on the left side, with a nontender enlargement of the submaxillary lymph nodes on the same side. Palpation of the upper lid showed the swelling to be due to two separate nontender masses, resembling chalazia in many ways. No ulceration nor erosion was seen, although a previous observer had noted a superficial ulceration along the margin of the middle of the upper lid. The adenopathy was not tender nor red; it was grouped in more or less distinct masses. No constitutional symptoms were present. The tuberculin test was two plus. Blood taken for the routine agglutinations was reported negative. The blood Wassermann test was positive. The mother's Wassermann reaction was negative. A biopsy of a cervical lymph node was reported as follows: chronic hyperplastic lymphadenitis. There was no histological evidence of tularemia nor of tuberculosis. The pathologist believed that this involvement could possibly have a syphilitic background.

Under active anti-syphilitic treatment the nodules in the upper lid and the adenopathy disappeared somewhat slowly but completely by the end of two months. The Wassermann reaction was still four plus at the end of eight months of treatment. There were no stigmata of congenital syphilis.

The third case was that of a colored child, aged three years, referred to me because of an obstinate blepharitis and conjunctivitis of a month's duration. Examination showed a moderate amount of redness and congestion of the palpebral conjunctiva. The lid margins were red, swollen, and thickened. A small nodule was present near the lid margin of each lid at the external canthus. A large mass

* Wright, R. E. Arch. of Ophth., 1937, v. 18, Aug., pp. 233-236.

was located at the angle of the jaw on the side involved. This adenopathy was not tender, about the size of a lemon plus several nodes. The Wassermann test was negative. The tuberculin test was four plus. The child's chest X ray was reported as showing no evidence of primary tuberculosis. Biopsy of a cervical node showed well-formed anatomical tubercles scattered through the lymphoid stroma.

At the present time the conjunctival nodules have disappeared, the lid swelling is very much reduced, and the adenopathy somewhat smaller. The absence of tuberculosis elsewhere in the body suggests this case as the rare manifestation of primary exogenous tuberculosis of the conjunctiva.

CONCLUSION

Three cases illustrating the oculoglandular syndrome of Parinaud are reported; one caused by tuberculosis, the second by syphilis, and the third by some undetermined agent.

A NEW INSTRUMENT FOR KERATOPLASTY*

ALBERT L. TAI, M.D.
Shanghai, China

The purpose of this new instrument is to simplify and modify the present technique of keratoplasty. It is a corneal punch, the upper blade of which is a ring, 4 to 6 mm. in diameter, having a very sharp cutting edge beveled inward (fig. 1, A). The lower blade is solid and has a spherical surface (fig. 1, B) corresponding to that of the cornea; its cut-



Fig. 1 (Tai). Corneal punch for keratoplasty. A, upper blade with sharp beveling-edged cutting blade; B, lower blade with solid spherical surface, whose cutting edge (C) is slightly raised.

ting edge should be slightly raised (fig. 1, C) in order to facilitate cutting (fig. 2). Any undue pressure upon the corneal flap, especially on the endothelium, should be carefully avoided, for injury to the endothelium invariably results in opacity.

The technique of the surgical procedure using this corneal punch is simple (fig. 3), as follows: (1) A conjunctival flap is prepared and an incision is made along the upper limbus, either with a keratome or with the von Graefe knife, as for cataract extraction. (2) The corneal punch is used to remove the leucoma and to make the graft. (3) The graft is covered with the conjunctival flap using either Castroviejo's method or Stallard's.

The new instrument is being manufac-

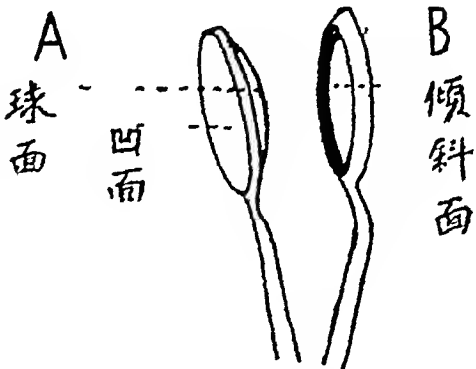
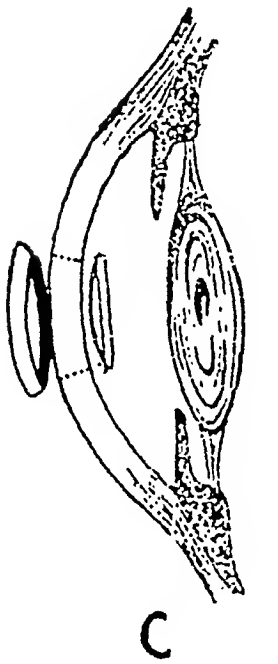
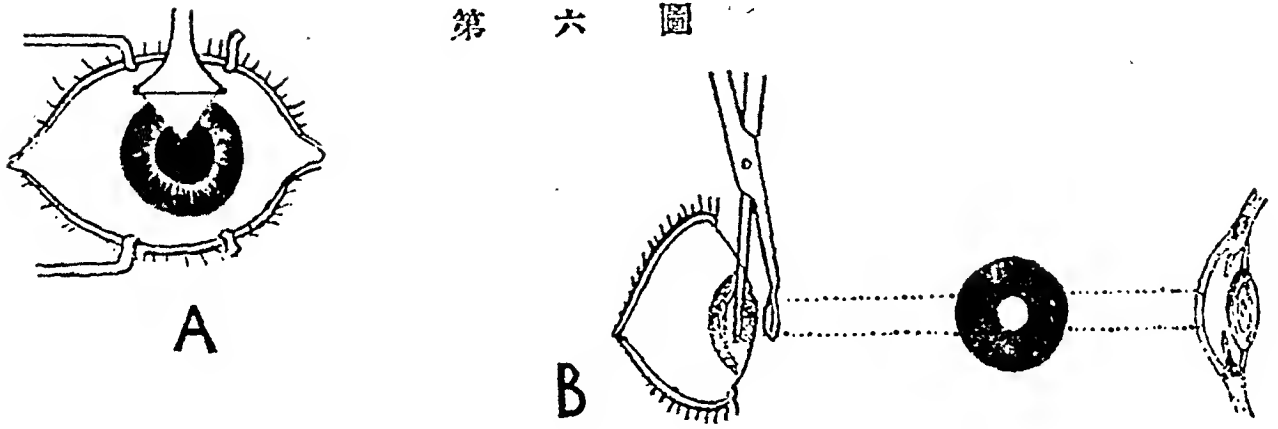


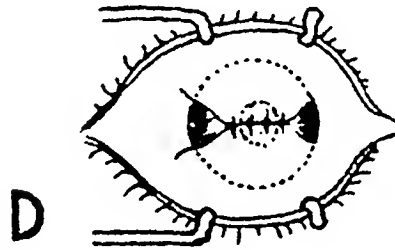
Fig. 2 (Tai). Diagrammatic sketch of corneal punch. A, spherical surface, concave side; B, beveling-edged ring blade.

*From the Department of Ophthalmology, Shanghai Sanitarium and Hospital. This is an abstract of a paper originally published in Chinese, in the National Medical Journal of China (1938, v. 24, November), republished herein with the illustrations at the request of the author because of the limited circulation of this journal among American ophthalmologists.

第 六 圖



橫剖面



第 七 圖

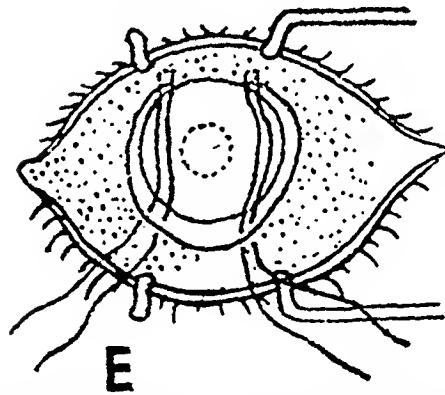


Fig. 3 (Tai). Surgical procedure. A, first step, keratome incision. B, second step, removal of leucoma, also cutting of graft. C, cross-section of second step. D, Castroviejo's method for completing operation. E, Stallard's method.

tured by the V. Mueller Instrument Company of Chicago. Some refinement will probably prove necessary, for the blade

is now perhaps a little too heavy and clumsy.

526 Bubbling Well Road.

SOCIETY PROCEEDINGS

Edited by DR. H. ROMMEL HILDRETH

COLLEGE OF PHYSICIANS OF PHILADELPHIA

SECTION ON OPHTHALMOLOGY

December 15, 1938

DR. ALEXANDER G. FEWELL, *chairman*

IRIDESCENT CRYSTALS IN THE CRYSTALLINE LENS

DR. ALEXANDER G. FEWELL and DR. STIRLING S. MCNAIR said they had reviewed the literature with special reference to cases in which the crystalline lens contained iridescent crystals. Ordinary crystals in the lens are not uncommonly found, but iridescent crystals in the lens are indeed infrequent. Most of the cases of iridescent crystals in the lens reported showed the crystals to contain some calcium salt, protein, or one of the amine acids. In their search through the literature, they were able to find only one case, reported by Beresinskaja, that by chemical analysis was proved to contain cholesterol crystals. In a majority of the cases reported the iridescent crystals were found bilaterally. Although these crystals are supposedly due to degenerative changes in a cataract, the majority of the cases reported stated that the remaining portion of the lens was clear. It is surprising how few lenses containing iridescent crystals have been extracted and examined chemically.

The case reported is that of a colored woman, 69 years of age, with bilateral anterior polar cataracts along with senile cataracts. She had had diabetes for the past four years and also suffered with hypertension. The vision O.D. was 3/60 and O.S. 2/60. Examination with the

slitlamp revealed large masses of brownish-golden glistening crystals somewhat tightly packed together in places and more dense and numerous in the center and on the temporal side. These crystals were mostly in the center of the lens and the remainder of the lens was relatively clear. The fundus was seen with difficulty on account of these crystals and lens opacities. The disc was somewhat dusky, arteries were reduced in caliber, and some retinal changes were seen in the macula, but no hemorrhages. The left eye showed a mature cataract but no crystals. The fundus of this eye could not be seen. The presenters expect to extract the lens of the right eye and subject its crystals to microchemical examination the results of which they hope to report at a later date.

Discussion. Dr. Alfred Cowan said the case which he reported before this Society three or four months ago was different from this one. In his case the crystals were very brightly colored, red, green, yellow, orange, and were more or less densely arranged in a zone in and around the adult nucleus. Actually, it was a case of presenile, zonular cataract that had undergone degeneration. He would consider the case here tonight an atypical complicated cataract.

Dr. William Zentmayer stated that some years ago, Dr. Verhoeff reported a case of coralliform cataract. A thorough analysis of the crystals forming the opacity showed them to be protein. Soon after this report, he removed a lens with the same type of cataract, and sent it to Dr. Verhoeff. The analysis showed the same type of crystals as was found in his own case.

OCULAR PEMPHIGUS

DR. JOSEPH V. KLAUDER and DR. VAN M. ELLIS reported the case of R. H., a white man, aged 21 years, who is unable to state exactly when the present condition started. He had had ocular trouble at the age of four years, at which age he was said to have had a growth on the right eye. The cornea of the right eye is clear. There is adhesion of the conjunctiva of the lower lid to the bulbar conjunctiva, obliterating the cul-de-sac. The upper cul-de-sac is narrowed but there is no symblepharon. The left cornea also is clear, and there is no involvement of the conjunctiva. The cul-de-sacs are, however, narrowed. The vision is unimpaired. There is no involvement of the mucous membranes of the nose, mouth, throat, urethra, or anus. There has never been any cutaneous involvement.

Discussion. Dr. H. Maxwell Langdon believed the condition did not look like pemphigus. He had never seen pemphigus limited to the lower cul-de-sac and had never seen it last so long without the other eye becoming involved. He thought it rather a possible scarring from the inflammation of 17 years ago.

Dr. Klauder, in conclusion, said they were glad to know Dr. Langdon's opinion. They are inclined to regard the condition as progressive. It appears to be more pronounced now than at the time they first saw the patient. In formulating their opinion of ocular pemphigus in this patient they were not entirely influenced by symblepharon, but placed considerable significance on the dry, lusterless, wrinkled appearance of the bulbar conjunctiva external to the cornea and above the symblepharon. Its appearance is that of shriveling, which is a conspicuous symptom eventually seen in all patients with ocular pemphigus.

OLD INTERSTITIAL KERATITIS

DR. JOSEPH V. KLAUDER and DR. VAN M. ELLIS presented the case of a white man, aged 58 years. He had always had poor eyesight and had worn glasses for many years. He remembered having sore eyes when a child but could not recall any details. He denied ever having a genital lesion. Following a blood test 10 years previously, he received injections in the arm at intervals for three months.

The pupils were unequal and irregular in outline; that of the right eye was fixed to light; the pupil of the left eye reacted slightly to light. Gross inspection of the corneas showed faint opacities. The vision with correction was: right eye 6/15, left eye 6/30. The central portion of the cornea was gray with a moderate loss of smoothness. The posterior surface was thickened, fairly opaque, and contained a number of old blood vessels deeply situated. Examination of the left eye was essentially the same. The patellar reflexes were absent and the Romberg sign was positive. He presented no stigmata of congenital syphilis excepting possibly the facies of congenital syphilis and had no subjective symptoms of tabes. The Wassermann reaction of the blood was four plus, the Meinicke reaction two plus. The spinal-fluid examination was negative in all phases.

The patient was presented to call attention to the importance of being conscious of the cornea in examining patients of any age suspected or known to have syphilis. This applies more to the clinician and syphilologist than to the ophthalmologist who is more cognizant of the significance of old corneal opacity as a clue in the diagnosis of old interstitial keratitis than is any other group of physicians.

Corneal examination, especially slit-lamp microscopy, may be an important

procedure in examination of a patient, especially an adult with a positive Wassermann reaction. These examinations may be the only means of determining that the patient has congenital syphilis.

LUPUS ERYTHEMATOSUS WITH EXUDATIVE RETINITIS EFFECTIVELY TREATED WITH GOLD

DR. JOSEPH V. KLAUDER and DR. VAN M. ELLIS said that E. D., a white man, aged 36 years, was first examined in April, 1938, at which time he exhibited on each side of the face and on the forehead bright red areas ranging in size from a dime to a half dollar. Some were infiltrated, all were devoid of scales. The scalp and mucous membranes were not involved. Ophthalmoscopic examination revealed various-sized, irregular, fluffy, cloudlike patches scattered throughout the fundi, particularly around the disc. There were small fresh hemorrhages around the maculae. Vision was 3/60 in each eye. Three months prior to this the patient had chills, fever, general malaise, weakness, and tiredness which necessitated bed rest. About that time he developed an eruption on the face. A month later he noticed blurring of vision. He was incapacitated from January, 1938, until about April because of progressive weakness and loss of 23 pounds in weight. There was no history of tuberculosis; he had always been underweight but of good general health. The Mantoux test, 1-100, was negative, Roentgenograms of the lungs were negative as was examination of the sputum for tubercle bacilli. The urinalysis and blood Wassermann reaction were negative. The blood sugar was 71.7; urea 13.6; uric acid 3.1. A complete blood count on March 26, 1938, showed red blood cells 4,640,000; white blood cells, 3,400; polymorphonuclears, 46 percent; eosinophiles, 1 percent; lymphocytes, 45 percent; mono-

cytes, 8 percent. On April 1st the white blood cells numbered 6,200 and on April 4th, 8,300. Histologic examination showed subacute diffuse dermatitis and atrophy of the epiderm with local hyperplasia.

Since April, 1938, he has been treated with gold and sodium thiosulphate intravenously (the maximum dose 50 mg.) and bismuth salicylate 2.5 c.c. intramuscularly. These drugs were given in courses at weekly intervals. Apparently this treatment has been effective. The skin lesions disappeared, he gained 15 pounds in weight, and is no longer tired. The appearance of the fundi improved. The retinitis is now quiescent. The optic disc has a pale white tint; it is well outlined. Some of the larger vessels have been replaced by scar tissue, other vessels are sclerosed and have a corkscrew appearance. The vision of both eyes is 6/60.

Discussion. Dr. Walter I. Lillie said the fundi reveal a diffuse perivasculitis and periphlebitis associated with pallor of the discs, and new blood-vessel formation around and involving each disc. Although a retinitis specific for lupus erythematosus has never been described, the retinitis observed before the sodium-gold-thiosulphate therapy was instituted could be of a toxic origin.

The present fundal change is similar to that which occurs after intravenous quinine therapy in a person with an idiosyncrasy to quinine.

In his experience, sodium gold thiosulphate has produced no untoward ocular effects and has been quite efficacious in cases of posterior uveitis.

THE PRODUCTION OF CORNEAL ULCERS IN THE RABBIT

DR. ROBB McDONALD and DR. HORACE PETTIT stated that a fairly standard staphylococcus ulcer suitable for experi-

mental purposes can be obtained providing one uses rabbits of approximately the same size and weight and sensitizes them with a vaccine of the same strain that is used to produce the ulcer. When one uses a nonhemolytic nonpigment-forming strain of staphylococcus, one can obtain an ulcer that has a minimum amount of conjunctival reaction but will show infiltration and staining of the cornea for approximately 10 to 12 days. When both eyes are injected at the same time, there is marked uniformity in the appearance and course of each ulcer. They suggest that this procedure be carried out when one eye can be treated and the other used as a control. They feel that the corneal reaction may be a very delicate test for specific antibodies and contemplate further investigation of the problem.

THE SURGICAL INDICATIONS IN PTOSIS

DR. EDMUND B. SPAETH read a paper on this subject.

Warren S. Reese,
Clerk.

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

SECTION ON OPHTHALMOLOGY

December 9, 1938

DR. FRANK N. KNAPP, *president*

THE VALUE OF TESTING DUCTIONS IN ROUTINE REFRACTION

DR. WALTER H. FINK, Minneapolis, presented a paper on this subject.

EXPERIMENTAL STUDIES OF VARIOUS WOUND CLOSURES USED IN CATARACT EXTRACTION, WITH CLINICAL APPLICATION

DR. ANDERSON HILDING, Duluth, presented a report which consisted largely of

a motion-picture demonstration of experiments in iris prolapse made upon enucleated ox eyes. It also included a demonstration of the application in clinical surgery of the points learned. The experiments consisted essentially in the production of iris prolapse in four different surgical procedures under controlled conditions. The prolapse was produced by the injection of saline into the eyes under measured pressure which could be controlled at will.

Four different methods of dealing with the limbal incision, which are commonly used in cataract surgery, were tested. They were (1) simple limbal incision with no measures taken to reinforce it against gaping, (2) incision covered with various types of flap, (3) incision closed by means of a sclerocorneal suture, (4) same as number three with the addition of a peripheral iridotomy.

Some 400 prolapses were studied under controlled conditions. The results demonstrated (1) that all conjunctival flaps that were tried (with one exception) failed to reinforce the incision materially, (2) that sclerocorneal sutures held the lips of the incision so firmly together that very considerable pressures (from 100 to 160 mm. of mercury) could be withstood before iris prolapse occurred, (3) that a peripheral iridotomy placed in such a way that it would coincide with the incision offered further protection against prolapse, (4) that an iridotomy was useless unless it coincided with the point of the incision that gaped, and was useless if it failed to emit fluid. Forty-six patients have been operated on by this method and allowed out of bed on the second postoperative day. There has been no prolapse nor incarceration in any.

Discussion. Dr. Frank Burch, St. Paul, said they are interested and pleased with the presentation which Dr. Hilding had given of proving the mechanics of iris

prolapse. It seems very sound and logical. In cataract work, everyone is agreed as to the value of sutures. There are a good many tricks in sutures and most operators have their own fetishes and prejudices and favorite methods in dealing with cataract wounds. The weak spot, perhaps, in Dr. Hilding's operation is that the wound is not covered with conjunctiva. Personally he would rather have a conjunctival flap than a section not covered with conjunctiva. Some time ago he visited Dr. Castroviejo and was shown how he had modified his cataract operations by a technique he was developing. He makes his incision with conjunctival flap close to the limbus, then, using a special atraumatic needle with unusually fine silk (needle made by Davis and Geck), sutures all around the wound. He believes he has performed 90 such operations without a prolapse. He was very enthusiastic about it, came home and tried it, and immediately had a prolapse; nevertheless, the method appealed to him. It seems logical and perhaps with greater practice he may be able to make conjunctiva-covered sections with sutures very close to the limbus and avoid prolapses.

The method they have used very extensively the last few years, which he borrowed from Dr. Gifford, is to make a Van Lint covered flap, first placing a mattress suture in the cornea just below the limbus. The conjunctiva is dissected free for a short distance around the proposed incision, the latter being made entirely within the cornea. A double-armed suture is passed through the conjunctiva above, drawing the conjunctiva over the wound. This makes a very tight wound, and he cannot recall any instance in which they have used it that prolapse has occurred.

Dr. Hilding's presentation is a very excellent way to approach the subject. He cannot quite agree with him about the

simple peripheral iridotomy as sufficient to permit fluid to come through from the posterior to the anterior chamber. A single peripheral iridectomy is preferable and serves the purpose. Of value also is the use of pilocarpine just before the section is made in case one is preserving a round pupil and then, after the sutures are placed, the injection of an air bubble into the anterior chamber. Following this, one-half percent eserine alkaloid bichloride ointment is put into the conjunctival sac. One of his associates, Dr. Hoffman, has insisted that both pilocarpine and eserine should be used to prevent iris prolapse, after completion of the operation. He believes there is some logic in using both miotics because of their slightly different manner of promoting miosis.

Dr. Charles N. Spratt, Minneapolis, said that Dr. Hilding has demonstrated what every surgeon knows and what every ophthalmologist should know, that healing takes place more quickly in a sutured wound, and there is less danger of prolapse or loss of cavity contents, whether the wound be of the abdominal cavity, the brain, or the eye. The use of the suture dates back to 1867 when Williams of Boston suggested a scleral conjunctival suture. While he was a house officer in Boston and New York, he never saw a cataract wound sutured. For the past 15 years he had been using a pocket flap with a conjunctival suture and he is sorry to state that he has had prolapse in some cases because he did not use good judgment in making an iridectomy, especially in elderly patients with rigid irides. These prolapses were protected by the conjunctiva and were thus free from danger of secondary infection. The use of the buttonhole, described by Chandler in 1890, or a small iridectomy would have avoided the prolapse. He believes that there is no question but that the corneoscleral suture makes a tighter

wound than the conjunctival suture. As the pressure of an eye is rarely over 25 mm. it seems unnecessary to consider pressure as high as 150 to 160 as shown in Dr. Hilding's demonstration.

Dr. Charles Hymes, Minneapolis, said that Dr. Hilding's presentation had been very illuminating. Referring to the triple iridotomy, a single well-functioning iridotomy should carry out the same purpose as the triple iridotomy. For this reason, in a closed fluid cavity, the hydrostatic pressure is equal at all points within the space, and any increase of that pressure is exerted equally upon all points within.

It is common knowledge that men who do a small amount of eye surgery, as well as beginners, have a great deal of difficulty in the performance of an iridectomy. The reasons, of course, are largely psychological, owing to the fact that the eyeball is open and soft, and any false move is fraught with danger.

By the results of Dr. Hilding's experiments, the eyeball with or without conjunctival sutures, is able to withstand a pressure of 15 to 20 mm. of mercury. This is almost as much as the normal intraocular pressure. There is really no great object in having the eye capable of withstanding pressures of 100 mm. of mercury or more. With the eye at reasonable rest following cataract extraction, in the hands of a large majority of ophthalmic surgeons, prolapse of the iris will take place but rarely.

He is not opposed to the corneoscleral suture, but he does feel that for the average eye surgeon the more simple he can make his cataract operation the happier both he and his patient will be.

Dr. Anderson Hilding, in closing, said in this operation the wound is covered by conjunctiva. When the sutures were placed in the sclera, the needle came through the conjunctiva rather high up.

When tied the conjunctiva slides down over the incision.

The Van Lint, and other flaps mentioned, all have the same objection; namely, that the conjunctiva is too distensible to offer any considerable reinforcement to the incision.

As to a single iridotomy compared with three, a single iridotomy is sufficient only in case the breach in the incision occurs at a point opposite the iridotomy. If it occurs anywhere else the iridotomy is useless. The matter may be summed up in this way: If there is sufficient intact iris to cover completely a breach in the incision, then iris prolapse would be possible even in the presence of six iridotomies. When a full iridectomy has been made, prolapse of one column or the other may occur. This is common experience.

Dr. Burch spoke of leaving an air bubble in the anterior chamber. From the standpoint of mechanics of prolapse, this is a splendid idea. The bubble holds the iris away from the cornea.

He does not know how much pressure an operated-on eye can withstand but it should be able to withstand enough to prevent prolapse of the iris. Prolapse still continues to occur when conjunctival flaps are depended upon to reinforce the incision. He does not believe that it is the normal intraocular pressure that we must fear in connection with prolapse. It is the unusual sudden pressure of the patient's hands, or some slight accident, or the increased pressure incident to coughing, sneezing, and so on. We do not know how high these pressures go.

The criticism that this operation is more complicated and difficult than some others is fair. It is more difficult to perform. Efforts to simplify are under way now, and he believes that they will be successful.

George E. McGeary,
Secretary.

LOS ANGELES SOCIETY OF
OPHTHALMOLOGY AND
OTOLARYNGOLOGY

December 19, 1938

DR. WILLIAM BOYCE, *chairman*

PRESENTATION OF CLINICAL EYE CASES
FROM THE LOS ANGELES COUNTY GEN-
ERAL HOSPITAL

DR. WARREN WILSON, Senior Resident in Ophthalmology (by invitation) presented the following cases:

Four cases of interstitial keratitis in conjunction with congenital lues, which were treated by malaria therapy. All showed great improvement. Before treatment vision was reduced to the ability to count fingers at three feet, while afterward one patient obtained 20/20 vision and the others better than 20/200.

A case of tubercular interstitial keratitis which remained placid under long continued tubercular therapy; this patient had been treated for six years.

A Mexican woman, aged 43 years, with unilateral proptosis of four years' duration, the etiology of which was unexplained. Complete physical and neurological examination, sinus and cranium X-ray films all were negative. Her basal metabolic rate was minus 11. Vision was 20/20 uncorrected. Possible soft tissue tumor behind the orbit seemed the most reasonable conclusion.

A case of osteogenesis imperfecta with associated blue sclera. This patient, 42 years old, has had over 40 fractures. His father had the same condition with associated otosclerosis. The patient has one normal sister and two sisters with otosclerosis and brittle bones, two normal brothers, and three brothers with brittle bones and blue sclera. One of the affected brothers has a son who also had brittle bones and blue sclera.

A 21 year-old girl with unilateral glau-

coma of over two years' duration. She had only light perception in the affected eye, a normal-sized cornea, very deep anterior chamber, and very deep cupping of the nerve head. This patient had two trephining operations, and on study with contact glass adhesions were seen in the iris angle only at the site of these two operations. However, since the second operation two months ago, the tension has remained normal.

A 45-year-old Negro, who is an albino, the only one in his family so affected so far as he knows. The patient had 20/70 vision in each eye with correction in spite of marked nystagmus.

DR. DAVID MCCOY, Junior Resident in Ophthalmology (by invitation) presented the following cases:

Four cases of trachoma in one family, two girls, aged 8 and 13 years, and two boys, aged 10 and 14 years, respectively, who had received ambulatory treatment with sulfanilamide and who are now apparently cured, having had no further treatment for the past four months.

One woman of 29 years, who had had trachoma for 18 months, was treated with sulfanilamide and was now apparently cured. There was marked regression of pannus. She had had no treatment for the past four months.

A woman, aged 26 years, with phthisis bulbi in the left eye following an automobile accident in 1925, at which time she received a perforating injury. In this eye the lens was apparently dislocated under the conjunctiva above. There was some scleral ectasia. Six weeks ago she received a contusion of the right eye followed by marked bulging of the upper nasal quadrant of the sclera, probably due to rupture with prolapse of the ciliary body. The lens was not dislocated and the vision was 20/20.

Harold F. Whalman,
Editor.

AMERICAN JOURNAL OF OPHTHALMOLOGY

Published Monthly by the Ophthalmic Publishing Company

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THE AMERICAN BOARD CELEBRATES

Available facts concerning the first definite movement toward the organization of the "American Board for Ophthalmic Examinations" (now the "American Board of Ophthalmology") have been admirably assembled and related by Beach (*Transactions American Ophthalmological Society*, 1938, volume 36, page 175; also *American Journal of Ophthalmology*, 1939, volume 22, page 367).

It has been suggested, not entirely in jest, but with only a modicum of truth, that the credit for creation and development of the American Board of Ophthalmology is due, not to the ophthalmologists, but to the so-called profession of optometry*.

The claims made to professional status by a group of refracting opticians did, perhaps, tend to put the ophthalmologists of this country more completely on their mettle, and may have reënforced the warnings uttered by Jackson, Wilder, and others to the effect that many ophthalmologists needed to do more careful refraction work. But, in the words of John C. Weeks, optometric utterances were "only one of the stimuli that were instrumental in the creation of the examining Board, and not an important one."

The twenty-fifth anniversary of the

*"Optometry," a word taken from the French language, signifies in the first place merely "measurement of vision." The use of the term "optometrist" to designate a refracting optician is about one generation old.

creation of the Board (1914-1939) was recently celebrated by a dinner held at the Palmer House, Chicago, in association with the annual meeting of the American Academy of Ophthalmology and Otolaryngology. Invitations had been sent out to all the Board's diplomates, now numbering something like 1,500; and the dinner was attended by 150 or more persons.

With Walter R. Parker, one of the early members of the Board, as toastmaster, addresses were delivered by Walter B. Lancaster, on "The Ophthalmic Board, looking backward and looking forward," and by Edward C. Ellett, one of the original members of the Board, on "Former members of the Board," this expression being applied to those who are no longer living, and including Albert E. Bulson, Alexander Duane, Lee M. Francis, James M. Patton, William Campbell Posey, J. Wendell Reber, Myles Standish, Frank C. Todd (first secretary of the Board), John M. Wheeler, William H. Wilder (secretary of the Board from 1918 to 1935), and Hiram Woods.

Lancaster, reviewing briefly some of the events dealt with more abundantly in Beach's historical survey, expressed the hope and belief that Beach would some day continue the story to include the Board's later activities. The speaker reminded his audience that the first recommendation favored by the reformers back in 1913 and 1914 was that Class-A medical schools should establish graduate courses in ophthalmology leading to a suitable degree. It will be remembered that the English universities at Oxford and Liverpool had already moved in this direction, and that Jackson had succeeded in establishing a similar course under the auspices of the University of Colorado.

When the American Board took definite form, the idea that it should confer a degree was taboo because the granting of degrees was a function of the universities. Licenses are obviously the business

of state governments, although the thought of using an examination as a basis for special licensure has been advanced and still finds supporters.

Lancaster recalled that the Board's "certificate, with its ophthalmoscope, fundus oculi, and serpent of Esculapius," had been designed by Casey A. Wood (who, we hope, is still enjoying his retirement at Rome, Italy).

When the Board's first examination was held at Memphis, in December, 1916, Jackson, against the urgent objections of the other Board members, insisted on sitting down with the candidates to take the written examination.

A year or so ago, when the Advisory Council of Medical Specialties, formed by the Council on Hospitals and Medical Education of the American Medical Association in conjunction with the various national examining boards, first formulated a standard of uniform requirements to be observed by all the boards, it became necessary to point out that facilities for institutional training of ophthalmologists were still inadequate, that (as Lancaster remarked) "two hundred men could not be squeezed into forty residencies, that less than twenty per year could be accepted by the few institutions with graduate courses on a university basis," so that "impractical though well-meant theory gave way before irresistible common sense and experience."

After the addresses by Lancaster and Ellett, the Board's chairman for the current year, Conrad Berens, presented to Jackson a framed illuminated address on parchment, carrying, above the names of all past and present members of the Board, a message of appreciation for the persistence and adroitness with which the recipient had led the original movement toward the creation of the Board.

We must recognize that some type of formal standardization and certification of special practice was a necessity and was

bound to develop. To ophthalmologists, however, it is naturally gratifying that their specialty should have pioneered in a movement which has now advanced to formation of twelve national examining boards, whose diplomates will shortly be listed in a directory to be published by the Advisory Council of the American Medical Association.

The present voluntary form of organization, conducted within the ranks of the medical profession, has distinct elements of superiority over earlier proposals for the establishing of licensing bodies in every state of the Union. It has stimulated material advance in facilities for special training, and is certain to promote even greater educational achievements in the years to come. The work of the pioneers commands our respect and admiration.

W. H. Crisp.

VITAMIN DEFICIENCIES IN OPHTHALMOLOGY

It has for many years been recognized that the usual errors of refraction are products of eyestrain, but no modern ophthalmologist is satisfied to confine his study of eyestrain to simple refraction. Other factors such as the general health, phorias, and aniseikonia must be considered.

The past week has witnessed an unprecedented influx of letters inquiring about aniseikonia. It would seem that hundreds of those suffering with asthenopia had read the recent article on aniseikonia in one of the popular magazines, because all of those who use the eikonometer have been deluged with requests for examinations. Undoubtedly inequality in the size of images is one of the many causes of eyestrain. How frequently it produces this effect is far from being determined. Another newly discovered cause is apparently vitamin-A deficiency, ac-

cording to an article by Cordes and Harrington in this issue of the Journal.

The importance of the vitamins in life has become increasingly apparent since their discovery a few years ago. This subject has taken hold of the public fancy almost equally with allergy, and if the cost were not prohibitive probably most of our patients would be consuming the little vitamin pills, many of them adding to an already adequate supply of vitamins. However, in this very interesting paper we have a group of people called to our attention who evidently are definitely deficient in at least one important element in metabolism; that is, if a low power of dark adaptation is a true index of it.

Why this avitaminosis should cause symptoms of eyestrain is not quite clear, except that it is now known that there is a measurable amount of vitamin A in the retina which obviously must have something to do with retinal functioning. If, therefore, vitamin A be deficient it is not unreasonable to suppose that an unusual effort of concentration might be necessary to produce a clear and intelligible visual interpretation. Apparently those who from any cause, whether dietetic or natural, have a deficiency of this vitamin are subject to visual inadequacy, as in the case of those whose eyes have been subjected to a bright light for a long time; and thus have used up this supply of vitamin A in the visual purple.

The simplest way to determine defective dark adaptation is with the Bio-Photometer, but this is an expensive instrument—not desired by everyone. It becomes important, therefore, to analyze the cases of asthenopia that have apparently derived from this cause with a view to determining whether anything in their histories or in the results of physical and ocular examinations would suggest such origin.

The authors have reported on 82 patients who suffered from persistent as-

thenopia in spite of refraction, and whose Bio-Photometer reactions were low. More than half were presbyopic, and two thirds were female. More than two thirds complained of sensitivity to light. A fairly typical group of symptoms is pointed out by the authors. The frequency of digestive disturbances and the absence of night blindness in most cases were interesting, the latter difficult to explain.

The results claimed for the therapy are truly remarkable in that four fifths of the patients had complete relief from symptoms. This is a striking report and is certain to attract much comment and to be given a full trial by many, so that before long confirmatory or contradictory reports should be available. May the event prove the case, for any therapy that will benefit these patients with persistent asthenopia will be most warmly welcomed.

Lawrence T. Post.

BOOK NOTICES

SURGERY OF THE EYE. By Meyer Wiener, M.D. and Bennett Young Alvis, M.D. Clothbound, 445 pages, 396 illustrations. Philadelphia and London, W. B. Saunders Company, 1939. Price \$8.50.

This is one of the most interesting books on the subject of surgery that has been written in many years. It does not pretend to be a complete reference book but includes the most important operations on the eye and gives almost in narrative form the authors' personal experience with them. There are many ideas that are original with the authors and have been proved successful by extensive trials in their hands. Having had one of the largest surgical practices in this country, Dr. Wiener is especially qualified to have written this kind of book.

The reviewer has had the pleasure of serving for many years on the same staff as the authors and has had the opportunity of seeing them operate and hearing

them teach; hence he knows the fundamental soundness of the principles they have here laid down. Many of Dr. Wiener's techniques have become a part of the routine in the ophthalmic departmental surgery at Washington University, where he has taught for many years. These range from the simple but most useful method of threading a needle with silk to the complicated but effectual gold-plate advancement of an extraocular muscle.

Throughout the book are valuable little suggestions such as the rolling down of the conjunctival flap in trephining—a favorite operation of Dr. Wiener's—over a toothpick applicator, and the circumcision of the cornea with a canaliculus knife, in enucleations.

In these days when corneal transplants have become practical there is still a place for the authors' operation of excision of scar tissue by means of a crucial incision. The restoration of vision made possible by this means is astonishing to those who have never tried it.

Approximately the middle third of the book is devoted to plastic surgery. Dr. Wiener taught this subject during the World War and ever thereafter it was a favorite field. The subject is clearly and concisely handled and is well illustrated, as is the entire book, both in number of pictures—there being almost one to a page—and in their diagrammatic value.

Among other original procedures dealt with are the open method of performing the Motaïs operation for correcting ptosis and the Wiener-Sauer dacryocystorhinostomy.

Most surgical texts are dry—serve only for reference. Here is a book that is readable and instructive, and one that will demand attention. Though naturally prejudiced, the reviewer is sure that to recommend this book highly to his confrères is doing it less than justice.

Lawrence T. Post.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

ASSISTED BY DR. GEORGE A. FILMER

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

- | | |
|--|--|
| 1. General methods of diagnosis | 10. Retina and vitreous |
| 2. Therapeutics and operations | 11. Optic nerve and toxic amblyopias |
| 3. Physiologic optics, refraction, and color vision | 12. Visual tracts and centers |
| 4. Ocular movements | 13. Eyeball and orbit |
| 5. Conjunctiva | 14. Eyelids and lacrimal apparatus |
| 6. Cornea and sclera | 15. Tumors |
| 7. Uveal tract, sympathetic disease, and aqueous humor | 16. Injuries |
| 8. Glaucoma and ocular tension | 17. Systemic diseases and parasites |
| 9. Crystalline lens | 18. Hygiene, sociology, education, and history |
| | 19. Anatomy, embryology, and comparative ophthalmology |

1

GENERAL METHODS OF DIAGNOSIS

Berezinskaja, D. I. A reply to Dr. I. M. Machlin (see below). *Viestnik Opht.*, 1939, v. 14, pt. 5, p. 68.

A defense of her technique in the investigation of the diffusion of acids and alkalies in the anterior chamber.

Ray K. Daily.

Machlin, I. M. Comments on Berezinskaja's article "Diffusion of acids and alkalies into the anterior chamber." *Viestnik Opht.*, 1939, v. 14, pt. 5, p. 67.

A criticism of Berezinskaja's technique and conclusions. (See *Amer. Jour. Ophth.*, 1938, v. 21, p. 1402.)

Ray K. Daily.

Rocha, Hilton. Roentgenograms in ophthalmology. *Ophthalmos* (Brazil), 1939, v. 1, no. 1, pp. 62-79.

With 19 illustrations, chiefly roentgenographic, the author considers especially the value of X-ray pictures in disturbances of the lacrimal passages

and as regards intraocular calcification. For the lacrimal cases, contrast was obtained with lipiodol and neo-iodipina. In two cases of chronic dacryocystitis, X-ray showed a bilocular condition of the sac. The intraocular cases include calcification of the choroid, of the lens, and of the retina. W. H. Crisp.

2

THERAPEUTICS AND OPERATIONS

Alvaro, M. E. Snake venom in ophthalmology. *Amer. Jour. Ophth.*, 1939, v. 22, Oct., pp. 1130-1146; also *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1938, 43rd mtg., p. 304.

Braunstein, H. E. Phototherapy in ophthalmology. *Viestnik Opht.*, 1939, v. 14, pt. 5, p. 63.

Description of a Soviet-manufactured device for ultraviolet irradiation, using an argon-mercury globe. (Illustration.)

Ray K. Daily.

Carlevaro, G. F. The action of vitamin B₁ in certain ocular affections

(clinical and experimental research observations). *Ann. di Ottal.*, 1939, v. 67, May, p. 355.

The efficacy of vitamin B₁ in various nerve affections such as alcoholic neuritis, and in other forms of polyneuritis has been well established but the mechanism through which it acts has not yet been demonstrated. The author carried out a series of experiments with vitamin B₁ in certain ocular affections in which studies were made of that form of avitaminosis secondary to deficient assimilation. In simple dendritic herpes the effect of Betabion was exceptionally good. In one case of herpes ophthalmicus with iridocyclitis and paresis of the abducens the use of vitamin was without effect. In tobacco-alcohol toxic amblyopia the effect of Betaxin intravenously was remarkably beneficial. Not only was the sight improved but there was increase in weight with general betterment. In the experimental research with animals the nerves were demyelinated and repair carefully observed. One group of these animals was given vitamin B₁, while a control group received no treatment. The action was found to be largely on the myelin sheath. (Bibliography, 2 plates.)

Park Lewis.

Castroviejo, Ramon. Mosquito lid-clamp retractors. *Amer. Jour. Ophth.*, 1939, v. 22, Sept., pp. 1018-1019.

Erlanger, Gustav. Iontophoretic medication in ophthalmology. *Arch. Physical Therapy*, 1939, v. 20, Jan., p. 16.

Iontophoresis, the introduction of drugs into living tissues by weak galvanic currents, is shown to be often much more effective than methods of medication usually employed. Experiments on rabbit eyes demonstrate the

strong effect of certain drugs on the autonomic system. Clinical observations are quoted to point out the value of this form of treatment in diseases of all parts of the eye. (Graphs.)

George A. Filmer.

Hallay, L. I. Oligoseptic treatment of ocular infection. *Amer. Jour. Ophth.*, 1939, v. 22, Sept., pp. 1012-1014.

Horner, W. D. Demonstration of a special solvent dispenser for removal of adhesive plaster. *Trans. Sec. on Ophth., Amer. Med. Assoc.*, 1938, 89th mtg., p. 301. (See *Amer. Jour. Ophth.*, 1939, v. 22, May, p. 541.)

Malte, C. V. A new anesthetic, dicaine. *Viestnik Opht.*, 1939, v. 14, pt. 6, p. 58.

The use of this preparation in the eye clinic and in 1,000 ophthalmic operations convinces the author that it is in no way inferior to cocaine.

Ray K. Daily.

Richman, F. A new surgical needle and holder. *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1938, 43rd mtg., p. 400.

The needle is firmly anchored to the handle to form a single unit, but is readily detached and replaced. There are two eyes, one near the point for carrying the suture and another further back for guiding the suture, with a groove along the undersurface connecting the two. The several steps in the technique of suturing by this new method are described. (2 illustrations.)

George H. Stine.

Terry, T. L., Chisholm, J. F., Jr., and Schonberg, A. L. Studies on surface-epithelium invasion of the anterior segment of the eye. *Amer. Jour. Ophth.*, 1939, v. 22, Oct., pp. 1083-1108.

Valle, Sergio. Snake anavenin in ophthalmology. *Arquivos Brasileiros de Oft.*, 1938, v. 1, Dec., pp. 105-123.

The author relates briefly 14 cases in which this substance was injected sub-conjunctivally for the relief of ocular pain of greatly varied causation. He had begun by using the substance in ocular complications of leprosy. It acts as an analgesic. W. H. Crisp.

3

PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Bari, Enzo di. Tolerances in the centering of spectacle glasses. *Boll. d'Ocul.*, 1938, v. 17, Dec., pp. 985-990.

On the basis of optico-physiologic considerations, the writer tabulates the tolerances of lenses up to plus and minus 20-D. lenses. M. Lombardo.

Berens, C. A prism scale. *Trans. Sec. on Ophth., Amer. Med. Assoc.*, 1938, 89th mtg., p. 302.

The author describes and illustrates a scale designed for the study of the amount of prism prescribed in glasses. (One illustration.) George H. Stine.

Bogoslovski, A. I. The dependence of the contrast sensitivity of the eye upon adaptation. *Ophthalmologica*, 1939, v. 97, July, p. 289.

For a low level of brightness of the test field (under one lux on white) regardless of its color, dark adaptation increases contrast sensitivity. When the field brightness is increased several lux on white, the differential threshold for red, blue, and white light in the daylight increases; in the dark it decreases. For green, it remains unchanged until the field brightness is increased to several hundred lux on white. The data for the other colors remain the same in this brighter light. F. Herbert Haessler.

Cowan, Alfred. Hypermetropia. *Amer. Jour. Ophth.*, 1939, v. 22, Sept., pp. 998-1002.

Fernandez Isassi, H. Optical data one should not forget. *Anales Soc. Mexicana de Oft. y Oto-Rino-Laring.*, 1938, v. 13, July-Dec., pp. 1-30.

Defines and describes many forms of single, bifocal, and tinted lenses, together with other details of daily refractive work. W. H. Crisp.

Georgariou, P. Occupational dyschromatopsia and the Ishihara color tests. *Bull. Soc. Hellénique d'Opht.*, 1939, v. 8, Jan.-March, p. 59.

The author has found that the majority of persons showing defective color perception by the Ishihara charts appear to have perfect color vision when tested with colored wool or glass. George A. Filmer.

Glees, M. A simple adaptometer. *Klin. M. f. Augenh.*, 1939, v. 103, Aug., p. 226.

The instrument is described and illustrated. It is handy and portable, and may be placed in any dark room. Several persons may be examined simultaneously. The examiner does not need to be dark-adapted.

C. Zimmermann.

Granit, R., Munsterhjelm, A., and Zewi, M. The relation between concentration of visual purple and retinal sensitivity to light during dark adaptation. *Jour. of Physiology*, 1939, v. 96, June 14, pp. 31-44.

The authors find that the rise in sensitivity lags behind the increase in the concentration of visual purple, and they conclude that the rise in sensitivity, as measured electrically during dark adaptation, is not a simple func-

tion of the curve depicting visual-purple regeneration in terms of density values.
T. E. Sanders.

Halper, P. A. Finer uses of the cross cylinder in refraction. *Illinois Med. Jour.*, 1939, v. 75, Feb., p. 115.

A review of some of the more common uses of the cross cylinder in refraction, particularly with a view to the interpretation of findings from an optical standpoint. Its value in determining the presence and axis of small astigmatic errors not accurately measured by retinoscopy is particularly noted. (Illustrations, discussion.)

George A. Filmer.

Hecht, S., and Mintz, E. V. The visibility of single lines at various illuminations and the retinal basis of visual resolution. *Jour. Gen. Physiology*, 1939, v. 22, May 20, p. 593.

The visual resolution of a single opaque line against an evenly illuminated background was studied over a large range of background brightness. It was found that the visual angle occupied by the thickness of the line when it was just resolved varied from about ten minutes at the lowest illumination to 0.5 second at the highest illumination, a range of 1200 to 1. This relation shows two sections, the data at low intensities representing rod vision, at high intensities, cone vision.

T. E. Sanders.

Jackson, Edward. Theory and use of cross cylinders. *Trans. Sec. on Ophth., Amer. Med. Assoc.*, 1938, 89th mtg., p. 21.

The history of the cross cylinder is reviewed, and the optical principles and clinical uses are described. (Discussion.)
George H. Stine.

Kalashnikov, V. P. Stability of accommodation in infectious diseases. *Viestnik Opht.*, 1939, v. 14, pt. 6, p. 35.

The state of accommodation was determined ergographically. None of the infectious diseases showed a specific curve, the curves differing with the degree of intoxication of the accommodative apparatus and not with the type of infection. The study shows that disturbance in accommodation was caused by toxins and not by high temperature. In most infections, including diseases of the lungs, malaria, and typhus, normal accommodation was restored during the period of convalescence, but some cases of grippe and angina showed a persistence of accommodative instability beyond the period of convalescence. Reading during the subfebrile period of convalescence while lying down and in poor light is conducive to accommodative instability.

Ray K. Daily.

Kravkov, S. V. The effect of caffeine on color sensitivity. *Viestnik Opht.*, 1939, v. 14, pt. 6, p. 61. (See *Amer. Jour. Ophth.*, 1939, v. 22, Aug., p. 930.)

Livingston, P. C. Analysis of the judgment of relative position. (Preliminary communication.) *Brit. Jour. Ophth.*, 1939, v. 23, Aug., pp. 540-544.

The author states that the object of his dissertation is to bring to notice certain features of binocular vision which in his opinion have not received full recognition, and which when studied carefully reveal close association with depth perception. Depth perception is said to be the highest stratum of spatial recognition. The use of rotating depth-perception apparatus, and of the rotating stereogram and pictures, is explained. (Illustrations.)

D. F. Harbridge.

Marquez, M. Contribution to the study of the ophthalmoscopic size of the direct image. *Arch. d'Opht. etc.*, 1939, v. 3, July, p. 580.

In this mathematic paper the author attempts to solve the problem of the size of the direct image. He believes that its diameter varies with the distance to which it is projected by the observer. This distance should correspond to the plane at which the inversed image is obtained by indirect ophthalmoscopy. (Diagrams.)

Derrick Vail.

Powell, L. S. The practical use of homatropine-benzedrine cycloplegia. *Amer. Jour. Ophth.*, 1939, v. 22, Sept., pp. 956-959; also *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1938, 43rd mtg., p. 264.

Prado, Durval. Skiascopy. *Arquivos Brasileiros de Oft.*, 1939, v. 2, Feb., pp. 1-5.

This is a brief statement with diagrams, of the application of optical principles to the practical technique.

Queiroga, Geraldo. Biochemistry of vision, its practical value in the light of biophotometry. *Ophthalmos (Brazil)*, 1939, v. 1, no. 1, pp. 41-56.

From experiments on frogs, supplemented by consideration of the literature of the subject, the author indulges in some rather vague conjectures with regard to light adaptation and the influence of avitaminosis. (Drawings, graphs.)

W. H. Crisp.

Terrien, F., and Onfray, R. Use and value of the diploscope in refraction. *Arch. d'Opht. etc.*, 1939, v. 3, July, p. 577.

Rémy in 1901 described the diploscope which the authors believe has not

received the attention it merits. By means of this simple instrument one can determine the state of visual acuity, the comparative size of the images of the two eyes, the condition of binocular vision, the state of the oculo-muscular equilibrium, and indirectly the correspondence of accommodation and convergence.

Derrick Vail.

Tree, M. A rotating cross cylinder. *Brit. Jour. Ophth.*, 1939, v. 23, Sept., pp. 632-633.

The author presents an illustration of his rotating cross-cylinder instrument together with a discussion of its advantages, as he believes, over the fixed type of Jackson's instrument. By the use of a cogwheel in the handle operated with the index finger, the axes of the cylinders are rotated instead of twirling the instrument as in the Jackson model. Jackson has always insisted that the twirling gives absolute suddenness to the change, thus producing a maximum contrast, but Tree believes his instrument to be less awkward.

D. F. Harbridge.

4

OCULAR MOVEMENTS

Borsotti, Ippolito. The importance of recognizing hyperfunction of the inferior oblique in the surgical treatment of paralysis of the superior oblique. *Rassegna Ital. d'Ottal.*, 1939, v. 8, March-April, pp. 123-178.

The author attempts to explain the divergence of opinion between American and European ophthalmologists as to the relative frequency and importance of paralysis of the superior oblique and that of the contralateral superior rectus. He reviews the physiology of the vertically acting muscles with especial regard to surgical treat-

ment of paralysis of the superior oblique. This is followed by a review and anatomic consideration of ten different surgical procedures for correction of the paralysis. The author feels that recession of the contralateral inferior rectus is the best method in most cases, as this establishes the static and dynamic equilibrium of the two eyes. It is stated that one may disregard the horizontal action of the vertically acting muscles, considering only the vertical and torsional components. Four cases are reported in detail in which myectomy of the inferior oblique was done with good results. The article is a valuable review of the physiology and surgery of the vertically acting muscles. (10 figures.)

Eugene M. Blake.

Krimsky, E. Descriptive atlas of orthoptic slides. Trans. Amer. Acad. Ophth. and Otolaryng., 1938, 43rd mtg., p. 404.

This atlas describes the author's slides and their use in a stereoscope. (References.)

George H. Stine.

Kupreev, S. H. Advancement with one suture. Viestnik Opht., 1939, v. 14, pt. 5, p. 29.

The one suture holds the middle third of the muscle and conjunctiva in a double loop, and perforates the episclera at the limbus. A report of 26 cases shows that this operation corrects more deviation than does Meller's operation. (Illustrations.)

Ray K. Daily.

Scala, N. P., and Spiegel, E. A. The mechanism of optokinetic nystagmus. Trans. Amer. Acad. Ophth. and Otolaryng., 1938, 43rd mtg., p. 277.

The authors studied the mechanism of the subcortical type of optokinetic nystagmus (passive) in cats and dogs, and found the production of this nystagmus depended on the integrity of

the superior colliculi. One-sided lesions of this structure impaired the nystagmus to the opposite side, while in bilateral lesions the most rudimentary reactions could be elicited by optokinetic impulses. These experiments suggest that the vestibular nuclei play an important part in the mechanism of passive nystagmus. (6 illustrations, tables, bibliography, discussion.)

George H. Stine.

Starkiewicz, Witold. Oculomotor disturbances and their treatment. Klinika Oczna, 1939, v. 17, pt. 3, p. 307.

An exhaustive review of the literature.

Ray K. Daily.

Stein, Lester. A polarizing screen for facilitating the cover test. Amer. Jour. Ophth., 1939, v. 22, Oct., pp. 1147-1149.

Sternberg-Raab, Alice. On double vision after squint operation. Brit. Jour. Ophth., 1939, v. 23, Aug., pp. 568-573.

The subject is discussed by means of case presentations, all adults as the author did not have the opportunity of observing the manifestation in children. The situation is comparatively rare. The cases studied fall under two classes, one being caused by a still faulty position of the eyes, the other by abnormal correspondence. In the one instance the task is to develop fusion amplitude, while in the other binocular vision is to be induced. The degree of squint and of the eventual angle gamma are of greatest importance both before and after the operation. (References.)

5

CONJUNCTIVA

Askalonova, T. M. Streptocide in the therapy of blennorrhoea in adults. Viestnik Opht., 1939, v. 14, pt. 5, p. 55.

A report of a case responding well to the internal administration of this therapeutic agent (a preparation similar to prontosil). Ray K. Daily.

Chang, S. P. **Clinical experiences with quinine treatment of trachoma.** Chinese Med. Jour., 1939, v. 55, May, pp. 439-447.

A series of 80 patients treated regularly two to three times a week for 2½ to 19 months with a 10-percent solution of quinine bisulphate is reported. The results were: completely cured 25 percent, almost cured 33.75 percent, considerably improved 30 percent, and no improvement 11.25 percent. On the average the effect of treatment became manifest in about two months, but usually at least six months was necessary for cure. A few patients were found to be resistant to quinine, but responded favorably to alternations of quinine with copper. T. E. Sanders.

Charamis, J. **Conjunctivitis in molluscum contagiosum.** Bull. Soc. Hellenique d'Ophth., 1939, v. 8, Jan.-March, p. 40.

A small granulation on the lid margin of an eye which had been subacutely inflamed for five months proved on histologic examination to be molluscum contagiosum. The conjunctivitis cleared spontaneously following excision of the tissue. George A. Filmer.

Cuénod, A., and Nataf, R. **Trachoma and the rickettsias.** Ophthalmologica, 1939, v. 97, July, p. 277.

A brief summary is given of recent morphologic and experimental studies of trachoma. From this summary the authors conclude that the infectious agent of trachoma has some characteristics of the rickettsia although it differs in other respects. They prefer the expression "rickettsioid body" to "trachoma rickettsia," and favor calling the trachoma virus "Prowazekia trachomatidis" in honorable acknowledgment of the work of Prowazek.

F. Herbert Haessler.

Cuénod, A., and Nataf, R. **Regarding the rickettsias of trachoma.** Arch. d'Ophth. etc., 1939, v. 3, July, p. 592.

A reply to Foley and Parrot (Amer. Jour. Ophth., 1939, v. 22, p. 1183) as to whether the so-called rickettsias of trachoma are true rickettsias.

Ivanov, H. K. **Tuberculosis of the conjunctiva.** Viestnik Ophth., 1939, v. 14, pt. 5, p. 24.

Three cases are reported in detail. The patients were all young women, and the disease was unilateral. One case was a primary conjunctival ulcer with enlargement of the retro-auricular lymphatic glands, and the result was recovery. In the second case, a metastatic conjunctivitis with a clinical picture of tuberculous nodules and follicles, the final cicatrization resulted in an entropion. The third case in the form of a tuberculoma, ending in atrophy of the globe, was caused by extension from the nose and mouth. Ray K. Daily.

Kattiofsky, W. **Experiences as to the efficiency of sulphanilamide in gonorrheal eye affections.** Klin. M. f. Augenh., 1939, v. 103, Aug., p. 214.

The chemotherapy of gonorrheal eye diseases is enriched by the sulphanilamides. Alburid is especially valuable, as it is easily soluble in water and has no toxic effect. C. Zimmermann.

Kulczycki, A., and Podworski, E. **Cytology of the trachomatous conjunctiva.** Klinika Oczna, 1939, v. 17, pt. 3, p. 419.

The material consisted of scrapings from the eyes of 35 children. The epi-

thelium of the trachomatous conjunctiva shows plasmonuclear changes; the products of karyokinetic division in the cells of the follicles are seen free or are contained in Leber's cells which act as macrophages. In all cases of untreated trachoma the smears made from the follicles show extra and intracellular bodies resembling Prowazek inclusion bodies and rickettsia. (Illustrations.)

Ray K. Daily.

Lapidus, I. M. The treatment of trachoma with intravenous injections of 1-percent solution of antimony tartrate. *Viestnik Opht.*, 1939, v. 14, pt. 5, p. 53.

The remedy was tried in thirty cases of severe trachoma with favorable results in five.

Ray K. Daily.

Loc, F. Sulphanilamide treatment of trachoma; preliminary report. *Trans. Sec. on Ophth., Amer. Med. Assoc.*, 1938, 89th mtg., p. 57.

The author treated 140 cases of trachoma with sulphanilamide, giving one-third grain per pound of body weight daily for ten days and then one-fourth grain per pound daily for fourteen days. Reactions were surprisingly few and mild. The results were remarkable with prompt recovery in all cases; however, it is too soon to speak of a permanent cure. Two cases are reported in detail. (Discussion.)

George H. Stine.

Maggiore, Luigi. Application of the Credé method for the prophylaxis of purulent ophthalmia of the newborn in Italy. *Ann. di Ottal.*, 1939, v. 67, June, p. 401.

Conditions were studied both from social and scientific aspects. Results have not invariably been considered satisfactory. The method of Credé has occasionally been followed by excessive irritation in the eyes of the newborn,

and in some instances disastrous results have followed its inexact application. This led the author to send a questionnaire to university clinicians, both ophthalmologists and obstetricians, as to their experience with the Credé method. All obstetric and other public hospitals are required to use a solution of 1-percent silver nitrate in the eyes of the child as directed. About one third of those answering the questionnaire preferred other silver salts to the nitrate. One regularly employed the acetate.

Park Lewis.

Makarov, H. H. The data of the Chita Hospital on the use of diphtheria antitoxin in the treatment of gonorrheal conjunctivitis in adults. *Viestnik Opht.*, 1939, v. 14, pt. 5, p. 57.

Ten brief case reports illustrate the excellent results of this form of therapy in adult blennorrhea. Very beneficial also was the injection of diphtheria antitoxin in six cases of ophthalmia neonatorum with threatened corneal complications.

Ray K. Daily.

Neuman, V. H. The use of glass prothesis in conjunctivoplasty after a free transplant of skin or mucous membrane. *Viestnik Opht.*, 1938, v. 14, pt. 5, p. 45.

The author uses a glass artificial eye to hold the transplant in place. (Illustration.)

Ray K. Daily.

Nicolacopoulos, J. Conjunctivitis in mollusum contagiosum. *Bull. Soc. Hellenique d'Opht.*, 1939, v. 8, Jan.-March, p. 41.

Report of a case of mollusum contagiosum of the lids accompanied by follicular conjunctivitis in a young child.

George A. Filmer.

Pascheff, C. New researches on con-

conjunctival plasmoma. *Klin. M. f. Augenh.*, 1939, v. 103, July, p. 54.

The author considers plasmoma as a local inflammatory, perhaps toxic, hyperplasia. In some cases he observed hyperleucocytosis. Plasmoma arises in the adventitia of the blood vessels, folliculoma in the endothelium. Folliculomatous hyperplasia (trachoma) develops in the adenoid stratum of the conjunctiva, plasmoma deeper in the conjunctiva, sometimes even infiltrating the orbit. C. Zimmermann.

Poleff, L. Regarding the rickettsias of trachoma. *Arch. d'Ophth. etc.*, 1939, v. 3, July, p. 594.

A reply to Foley and Parrot (*Amer. Jour. Ophth.*, 1939, v. 22, p. 1183) as to whether the so-called rickettsias of trachoma are true rickettsias.

Prado, D., and Mignone, C. Plasmocytoma of the conjunctiva. *Arquivos Brasileiros de Oft.*, 1938, v. 1, Dec., pp. 99-105.

The authors' case involved both eyes, in a girl of 12 years. A photomicrograph printed in color shows typical staining of the plasmocytes. Extirpation of the masses resulted in permanent cure. (8 illustrations.)

W. H. Crisp.

Rein, W. J., and Tibbetts, O. B. Irrigations with sulphanilamide as a treatment for gonorrheal conjunctivitis. *Amer. Jour. Ophth.*, 1939, v. 22, Oct., pp. 1126-1129.

Rudenko, V. F. Cicatricial contraction of the conjunctiva in dermatitis herpetiformis Düring. *Viestnik Opht.*, 1939, v. 14, pt. 5, p. 71.

This is the report of a case of shrinking of the conjunctival sac with resulting entropion which developed dur-

ing the course of dermatitis herpetiformis Düring. This form of dermatitis is therefore to be considered an etiologic factor in cicatrization of the conjunctiva, along with trachoma, burns, pemphigus, smallpox, and diphtheria.

Ray K. Daily.

Rumantzeva, A. F. Partial and total restoration of the conjunctival sac. *Viestnik Opht.*, 1939, v. 14, pt. 5, p. 38.

Of the various plastic procedures tried, the author's best results were obtained by the use of a free transplant of skin from the shoulder, large enough to line the conjunctival sac and held in place by a glass or porcelain ball. (Illustration.)

Ray K. Daily.

Starostina, O. I. The Weil-Félix reaction in trachoma. *Viestnik Opht.*, 1939, v. 14, pt. 6, p. 33.

The serum of ninety trachoma patients was tested, with negative results in all cases.

Ray K. Daily.

Trantas, N. Notes on vernal catarrh. *Bull. Soc. Hellénique d'Ophth.*, 1939, v. 8, Jan.-March, p. 66.

The author discusses his study of 38 cases of vernal catarrh using the slit-lamp and Gzapski microscope. He describes in detail the pathology in the tarsal and bulbar conjunctiva, with special attention to the character and structure of meshworks of fine, white, thread-like formations.

George A. Filmer.

Trapezontzeva, E. Rickettsias in trachoma. *Viestnik Opht.*, 1939, v. 14, pt. 6, p. 29.

This, Trapezontzeva's fifth investigation on the subject, deals with the Weil-Félix reaction in trachoma. She tested the serum of 100 patients, 71 in the various stages of trachoma. The re-

action was inconstant, and she concludes that the Weil-Félix reaction has no significance in trachoma.

Ray K. Daily.

Wahlman, H. F. Vernal conjunctivitis. *Trans. Sec. on Ophth., Amer. Med. Assoc.*, 1938, 89th mtg., p. 31.

The author describes several clinical forms of this disease. In his opinion tests for specific allergins and subsequent desensitization have proved of little value. He prefers solutions of acid rather than alkaline reaction. (Discussion.)

George H. Stine.

Windham, R. E. Ocular papilloma. *Amer. Jour. Ophth.*, 1939, v. 22, Sept., pp. 966-971; also *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1938, 43rd mtg., p. 245.

Wood, M. A. A study of methemoglobin-producing organisms in ocular inflammations. *Amer. Jour. Ophth.*, 1939, v. 22, Oct., pp. 1111-1119.

Zachert, Marian. Antistreptin in the treatment of trachoma. *Klinika Oczna*, 1939, v. 17, pt. 3, p. 428.

Antistreptin is a preparation similar to sulphanilamide. It was administered in 65 cases of severe trachoma, in addition to the usual local treatment. The author believes that its administration helps to relieve the conjunctival irritation, diminishes the granulations and secretion, and alleviates the subjective symptoms.

Ray K. Daily.

6

CORNEA AND SCLERA

Adamantiadis, B. Certain occupational keratopathies. *Bull. Soc. Hellénique d'Ophth.*, 1939, v. 8, Jan.-March, p. 108.

In grinders and marble cutters, the cornea may be found studded with

small foreign bodies at about the level of Bowman's membrane. There is no inflammatory reaction, but the chronic trauma may give rise to an irregular astigmatism resulting in diminished visual acuity.

George A. Filmer.

Anderson, C. R., and Wilson, W. A. Active interstitial keratitis of late prenatal syphilis; its treatment. *California and Western Med.*, 1939, v. 50, March, p. 196.

Thirteen acute and nine chronic cases of active interstitial keratitis were treated by means of fever therapy. The milder cases were given typhoid-paratyphoid vaccine, while the more severe ones were inoculated with malaria. Results were very encouraging, the rapid response to the use of malaria being particularly striking.

George A. Filmer.

Beam, A. D., and Lindberg, V. L. A case of herpes zoster ophthalmicus. *Jour. Michigan State Med. Soc.*, 1939, v. 38, April, p. 301.

Herpes zoster is briefly described and mention made of the array of cures recommended for the disease. Walker and Walker's treatment by the use of diphtheria antitoxin (*Amer. Jour. Ophth.*, 1939, v. 22, p. 114) is discussed at great length. The case here reported (herpetic involvement of the lids and cornea) responded favorably to two 5,000-unit intramuscular doses of diphtheria antitoxin. The authors do not draw conclusions from this single case but feel that the treatment deserves further trial.

F. M. Crage.

Cardello, Giovanni. Herpes corneae and disciform keratitis. *Rassegna Ital. d'Ottal.*, 1939, v. 8, March-April, pp. 222-239.

Cardello reports eleven cases of

herpes corneae observed within one year, all within a comparatively limited area. Each patient had been affected by influenza; there were no cases of traumatic origin. Two developed a disc-like opacity, which almost entirely cleared, giving support to the belief that herpes is the cause of keratitis disciformis. Animal inoculation was positive except in cases seen late. Seventy percent of the inoculated animals developed encephalitis. The author feels that the use of neurovaccine (a filtrate of *B. pyocyaneus* and *staphylococcus aureus*) was of definite value. From three to six injections of this nonspecific serum were given and seemed to relieve the discomfort of the patient and hasten recovery.

Eugene M. Blake.

Czukrász, Ida. Vitamin B_1 in the treatment of hypovitaminosis. *Klin. M. f. Augenh.*, 1939, v. 103, Aug., p. 221.

In ten cases of hypovitaminosis with ulcers of the cornea, application of betaxin and other vitamin- B_1 preparations in the form of salves or injections proved very beneficial.

C. Zimmermann.

Dalsgaard-Nielsen, Esther. On disablement and social conditions of patients with past syphilitic interstitial keratitis. *Brit. Jour. Ophth.*, 1939, v. 23, Aug., pp. 544-556.

Material comprising 173 patients with past interstitial keratitis was examined. The author's investigations were devoted particularly to the question of whether the disease caused enough disablement to impair the practical earning power of the patient. It was noted that 79 percent of the patients themselves stated that they were perfectly capable of work, 7 percent were only partially capable, and 14

percent were probably disabled to a degree less than one third of average working capacity. The 14 percent must be considered a definite social encumbrance. The patients' statements in the main agreed with the physician's estimation of disablement. The findings of the author reveal the disabling factors to be impairment of vision, deafness, and nervous complications. Tables are offered to demonstrate these findings. The disease has not occasioned any particular reduction in social status, 38 of 51 patients holding the same social standing as their parents and 7 having advanced socially, only 6 having descended. (References.)

D. F. Harbridge.

Larsen, Victor. Parenchymatous syphilitic keratitis and syphilitic atrophy of the optic nerve treated with sulfosin. *Brit. Jour. Ophth.*, 1939, v. 23, Sept., pp. 585-622.

Clinically the two conditions discussed are widely different in their manifestations, but they do have one common feature: a syphilitic origin which is little influenced by ordinary antisypilitic treatment. Sulfosin, the remedy used in this investigation, is a 1-percent partly dissolved sulphur sublimate in olive oil. Seventeen cases treated with sulfosin were compared with 22 controls. The use of the drug shortened the hospital stay of the patients so treated and produced a quicker subsidence of such conditions as photophobia and lacrimation. Sulfosin did not protect against parenchymatous keratitis in the second eye but the course of the affection of the second eye was less severe than in cases not so treated. In the opinion of the author treatment with sulfosin checks, temporarily at least, atrophy of the optic nerve. Central vision, the field of vision,

and color vision may improve, improvement continuing for as long as a year after the course of treatment is terminated. Some cases are aggravated by the treatment, four such being noted.

D. F. Harbridge.

Nakhminovich, I. M. Transplantation of peritoneum on the eyeball. *Viestnik Opht.*, 1939, v. 14, pt. 5, p. 32.

In the search for easily available transplant material histologically and functionally similar to conjunctiva, capable of rapidly and easily adhering to large surfaces of underlying tissue, and free of cosmetic objections, it occurred to the author to try peritoneum. He used a strip 2.5 by 1 cm. in a Denig operation for pannus. The result was excellent.

Ray K. Daily.

Pariser, Harry. Acquired syphilitic interstitial keratitis. *Amer. Jour. Syph. Gonorrhea, and Venereal Dis.*, 1939, v. 23, March, p. 214.

A report of two cases of interstitial keratitis occurring in patients with acquired syphilis. George F. Filmer.

Pascheff, C. Research on true granuloma of the cornea in comparison to plasmoma, folliculoma, and fibropapilloma. *Boll. d'Ocul.*, 1938, v. 17, Dec., pp. 978-984.

A case of true granuloma of the left cornea of a woman 54 years of age is described. The eye was red, painful, and photophobic. A white vegetation protruded from the infero-external quadrant of the corneal surface. Numerous blood vessels coming from the corresponding limbus extended superficially and deeply into the surrounding clear cornea. A histologic description is given of the neoformation. An inflammatory granuloma of the left cornea is also reported in a woman of 48 years

affected by cicatricial trachoma. The cornea was covered by a richly vascular vegetation, the eye being painful, enlarged, and hard. A histologic description is also given of this granuloma. These vegetations are prevalently vascular and contain polynuclear leucocytes, similar to the inflammatory granulations seen following wounds of the conjunctiva. They are to be differentiated from the vegetations of spring catarrh (rich in fibrous tissue and eosinophiles), from the plasmomas of the conjunctiva, and from the folliculomas seen in trachoma. (7 figures.)

M. Lombardo.

Pergola, Alfredo. A case of traumatic herpes corneae associated with Hörner's syndrome. *Rassegna Ital. d'Ottal.*, 1939, v. 8, March-April, pp. 197-210.

A miner aged 43 years was struck in the left eye by a chip of stone. An abrasion of the cornea resulted. After a few days of apparent improvement a typical herpetic eruption of the surrounding cornea occurred. Within a few weeks the classical symptoms of Hörner's syndrome occurred (narrowing of the palpebral fissure, enophthalmos, miosis, and localized iris atrophy). The latter condition gradually cleared and the corneal process healed with only a faint scar. The author goes fully into the differential diagnosis of corneal herpetic lesions and other changes and reviews the literature of herpes corneae. (One figure.)

Eugene M. Blake.

Rhodes, A. J. Studies on the bacteriology of hypopyon ulcer. 3. A bacteriological investigation of 120 cases of hypopyon ulcer. *Brit. Jour. Ophth.*, 1939, v. 23, Sept., pp. 627-630.

The results of this bacteriologic study indicate that, contrary to the findings of other workers, pneumococci

occupy a relatively unimportant place (11.6 percent). Of the cultures, 21.6 percent showed no growth, 32.4 percent diphtheroid bacilli, and 12.5 percent staphylococcus albus. Other types ranged from 0.8 percent to 3.3 percent. The investigation tends to lessen the emphasis placed on the purely infective element in hypopyon ulcer. The powers of resistance to infection of the corneal tissue are the more essential factors. (References.) D. F. Harbridge.

Roggenkämper. Corneal ulcer and prontosil. *Klin. M. f. Augenh.*, 1939, v. 103, Aug., p. 221.

Within the last half year the author has systematically treated all ulcers of the cornea with prontosil. The results as to vision were surprisingly good.

C. Zimmermann.

Sandler, I. L. Sulphanilamide treatment of syphilitic interstitial keratitis. *Arch. Derm. and Syph.*, 1939, v. 39, March, p. 528.

A preliminary report of a case of relapsing interstitial keratitis which responded dramatically to the administration of sulphanilamide.

George A. Filmer.

Staz, L. An unusual condition of the posterior surface of the cornea (posterior herpes of the cornea). *Brit. Jour. Ophth.*, 1939, v. 23, Sept., pp. 622-626.

The condition described was observed in a young man aged 18 years, who was kept under observation for a period of practically six years. In the upper part of the corneal endothelium of the right eye there was a horizontal grayish-white band which gave the impression of being caused by ruptured vesicles. A similar condition was noted in the lower half of the left eye. Vision in each eye was 6/9, with correction

6/6. After six years observation the condition remained about the same. (Review of literature, illustrations.)

D. F. Harbridge.

Suganuma, Sadao. Clinical and histologic findings in a case of primary posterior scleral tuberculosis. *Klin. M. f. Augenh.*, 1939, v. 103, Aug., p. 208.

A man of 22 years, who had a left-sided pleurisy, showed slight exophthalmos and episcleritis of the left eye, a detachment of the retina beginning near the macula, several grayish-white round foci of the choroid, and a second flat detachment of the retina in the lower periphery. Examination showed that an intrascleral tuberculoma at the posterior pole was primary in the sclera and was not a tuberculosis of the choroid with secondary involvement of the sclera.

C. Zimmermann.

Tarlovskaja, S. I. Lysozyme in the therapy of corneal diseases. *Viestnik Opht.*, 1939, v. 14, pt. 5, p. 20.

Of 53 cases of *ulcus serpens* and infected corneal wounds following burns and traumatism treated with lysozyme, there was a favorable effect in 81.1 percent, a doubtful effect in 13.2 percent, and a negative effect in 5.7 percent. The author urges the inclusion of lysozyme among the therapeutic agents used in keratitis. Its bactericidal potency is higher than that of any other antiseptic, it acts as an analgesic, stimulates epithelization and regeneration, and is harmless. The effect usually manifests itself in five or six days, but sometimes not until the tenth or eleventh day.

Ray K. Daily.

Tichova, V. A. Local vitamin therapy in ocular diseases. *Viestnik Opht.*, 1939, v. 14, pt. 5, p. 16.

In the author's experience instillation

of cod-liver oil with vitamin D produced favorable results in hitherto resistant cases of various types of keratitis, the favorable effect being manifested by the shortened duration of the disease and by the end result. The oil acts as an analgesic, diminishes blepharospasm, and hastens epithelization. Miotics augment the effect of the cod-liver oil.

Ray K. Daily.

Tjanidea, T., and Manoussis, S. Corneal transplantation after the method of Filatov-Nižetić. *Bull. Soc. Hellénique d'Opht.*, 1939, v. 8, Jan.-March, p. 115.

The authors present a case and describe their operative procedure. They use and recommend the bistoury and trephine of Nižetić.

George A. Filmer.

Windham, R. E. Ocular papilloma. *Amer. Jour. Ophth.*, 1939, v. 22, Sept., pp. 966-971; also *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1938, 43rd mtg., p. 245.

7

UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Chavira, R. A. Sympathetic ophthalmia. *Anales Soc. Mexicana de Oft. y Oto-Rino-Laring.*, 1938, v. 13, July-Dec., pp. 33-39.

Relates three cases following accidental injury and one following cataract operation.

Drake, M. E., Renshaw, R. J. F., Modern, F. S., and Thienes, C. H. The smooth muscle actions of epinephrine substitutes. 7. Responses of denervated smooth muscles of iris and intestine to epinephrine, ephedrine, amphetamine (benzedrine), and cocaine. *Jour. Pharm. and Exper. Therapeutics*, 1939, v. 66, July, p. 251.

The iris of cats and rabbits was denervated by excision of the superior cervical ganglion. Mydriasis in the normal eye was caused by instillation of epinephrine, ephedrine, amphetamine, or cocaine, but was prevented by denervation. No final conclusions were drawn concerning the site and manner of peripheral action of these drugs. The evidence is definitely against sympathicotrophic effects, but gives little support to a musculotropic action.

T. E. Sanders.

Filatov, V. P. Treatment and prophylaxis of myopic chorioretinitis. *Vestnik Opht.*, 1939, v. 14, pt. 6, p. 18.

The effectiveness of osmotherapy in the form of intravenous injections of 10-percent saline solution, of transplantation of preserved skin on the temples, and of intramuscular cod-liver-oil injections is demonstrated in brief clinical case reports.

Ray K. Daily.

Koch, C., Schreiber, B., and Schreiber, G. Metaplastic osteoplasia in transplantation of the urethra into the anterior chamber of the guinea-pig eye. *Ophthalmologica*, 1939, v. 97, July, p. 284.

Urethral segments of embryo and adult guinea pigs were transplanted into the anterior chamber of the eye of the guinea pig. Eight transplants were done and examined histologically. In all of them, bone formation was induced in contiguous new-formed connective tissue. Osteoplasia was noted as early as the eighteenth day. The great, if not specific, ability of the urethra to induce bone formation is pointed out.

F. Herbert Haessler.

Rosner, L., and Bellows, J. The passage of sorbitol from the blood into the aqueous and cerebrospinal fluid. *Amer.*

Jour. Physiology, 1939, v. 125, April 1, p. 652.

Sorbitol injected intravenously produces a fall in intraocular pressure as a consequence of its osmotic properties. Glucose also produces this effect, but, because it later diffuses readily from the blood into the aqueous, the intraocular pressure rises again. Sorbitol, however, was found to pass from the blood into the aqueous in relatively small amounts. (Tables.)

George A. Filmer.

Samuels, B. **Ossification of the choroid.** Trans. Amer. Acad. Ophth. and Otolaryng., 1938, 43rd mtg., p. 193.

The author has made an exhaustive study of 81 ossified globes enucleated mostly because of atrophy, phthisis, or secondary glaucoma. He concludes among other things that traction is the important stimulus for formation of bone, that danger of sympathetic ophthalmia from globes ossified after perforation is practically nonexistent, and that development of sarcoma is also unlikely. (38 illustrations, bibliography, discussion.)

George H. Stine.

Shevelev, M. M. **Activation of the sympathizing eye after cataract extraction on the other eye.** Viestnik Ophth., 1939, v. 14, pt. 6, p. 71.

A report of two cases. Each of the patients had had an old injury in one eye with cataract in the other and had had the cataract extracted. The operated eyes developed sympathetic ophthalmia. In one case the eye recovered following enucleation of the injured eye. In the other case, delayed because of the patient's objection, the enucleation was done too late to save the operated eye. These occurrences point to the advisability of enucleating a blind

eye previous to surgical operation on the fellow eye.

Ray K. Daily.

Volokitenko, A. E. **Osmotherapy in myopic chorioretinitis.** Viestnik Ophth., 1939, v. 14, pt. 6, p. 22.

An analysis of the results in 24 cases treated with intravenous injections of 10-percent sodium chloride. The report shows improvement in visual acuity in 84.5 percent of the cases. The visual field expanded 20 to 30 percent in five cases, 8 to 19 percent in eleven cases, and in five cases remained unchanged. Absolute scotomata, present in 11 cases, disappeared in two cases, diminished in size in two cases, and remained unchanged in seven. The author urges the use of osmotherapy as a harmless and effective therapeutic procedure.

Ray K. Daily.

Zenkina, L. V. **Pigment-epithelium changes in the anterior chamber.** Viestnik Ophth., 1939, v. 14, pt. 5, p. 69.

Pigment vesicles developed on the lens capsule in the course of severe traumatic iridocyclitis. They were demonstrable only with high biomicroscopic magnification. The author believes them to have been groups of cells of the posterior layer of the pigment epithelium of the iris, which had become vesicular as a result of hydropic changes. (Illustrations.)

Ray K. Daily.

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GLAUCOMA AND OCULAR TENSION

Casini, Francesco. **Considerations and researches in a case of chronic simple glaucoma with delayed hypertension.** Arch. di Ottal., 1939, v. 46, Jan.-Feb., pp. 40-70.

The patient, a woman of 66 years, complained of failing vision and violent

pains over the eyes, sometimes accompanied by vomiting. The visual fields showed marked contraction, there was moderate excavation of the discs, the right pupil was moderately and the left decidedly dilated, and the anterior chambers were shallow. The left iris had areas of atrophy and the left vitreous was cloudy. The tension of the right eye was 18 mm., that of the left eye 15 mm. (Schiötz). Intradermal injections of caffeine and of histamine produced strong positive reactions, the tension of the right eye rising to 44 mm. and that of the left eye to 65 mm. under histamine. After each such experiment the tension was easily brought back to normal with eserine. The author reviews the literature relating to chronic simple glaucoma with delayed hypertension and to glaucoma without hypertension. W. H. Crisp.

Gandolfi, C. Behavior of the retinal vessels under glaucomatous pressure. *Ann. di Ottal.*, 1939, v. 67, June, p. 433.

The author studied a group of glaucomatous eyes taking both the general blood pressure and that of the retinal arteries, employing the method of Bailiart. He concluded that a higher blood pressure helps to maintain the capillary flow necessary for the nutrition of the neuroretinal elements, and is in agreement with the observation of Lauber that when the blood pressure is low the prognosis is not so favorable as when it is high. (Bibliography.)

Park Lewis.

Hamburger, Carl. On the treatment with "glaucon" of cases of glaucoma operated upon without success, and of complicated cataracts. *Brit. Jour. Ophth.*, 1939, v. 23, Aug., pp. 557-567.

A discussion of how glaucoma is to be treated when surgical intervention has failed or, at best, resulted in only

temporary success. It is the author's opinion that a second operation should not be attempted until the use of glaucon drops has been given a trial. Two cases are presented to demonstrate the advantages of this treatment, and a detailed explanation of the steps in glaucon massage is given. A further presentation of cases demonstrates the use of glaucon drops in complicated cataracts. (Tables.) D. F. Harbridge.

Odintzov, V. P. Conservative and surgical treatment of glaucoma. *Viestnik Opht.*, 1939, v. 14, pt. 6, p. 3.

A review of the literature, an emphasis on the fact that glaucoma is a general and not a local disease, and a plea for individualization in treatment. The surgical procedures used by the author are Elliot trepanation and cyclodialysis. Ray K. Daily.

Reese, A. B. The value of early operation in chronic primary glaucoma. *Jour. Amer. Med. Assoc.*, 1939, v. 113, Sept. 23, p. 1204.

From a study of 105 selected cases of chronic primary glaucoma in both early and advanced stages, the author concludes that the disease is quite tractable if operation, when indicated, is done in the early stages. For best results the operation should be done before there is enlargement of the blind spot and constriction of the field, and certainly before there is any cupping of the disc. (Discussion.)

George H. Stine.

Rosner, L., and Bellows, J. The passage of sorbitol from the blood into the aqueous and cerebrospinal fluid. *Amer. Jour. Physiology*, 1939, v. 125, April 1, p. 652. (See Section 7, Uveal tract, sympathetic disease, and aqueous humor.)

NEWS ITEMS

Edited by DR. H. ROMMEL HILDRETH

640 S. Kingshighway, Saint Louis

News items should reach the Editor by the twelfth of the month

DEATHS

Dr. Frederick Stauffer, Monterey, California, died July 20, 1939, aged 72 years.

Dr. James Homer Buckley, Fort Smith, Arkansas, died July 31, 1939, aged 64 years.

MISCELLANEOUS

The American Board of Ophthalmology announces a written examination, March 2, 1940, in various cities throughout the country. This will be the only written examination in 1940. All applications for this examination must be received before January 1, 1940. All applicants must pass satisfactory written examination before being admitted to oral examination. Oral examination: New York City, June 8th and 10th. Fall examination to be announced later. Case reports: Candidates planning to take June examination must file case reports before March 1st. For application blanks write *at once* to Dr. John Green, 6830 Waterman Avenue, Saint Louis, Missouri.

George Brewster and Jennie Mathews Honorarium. An honorarium of \$1,000 to promote research work in ophthalmology is offered through the International Association for the Prevention of Blindness, the jury to consist of the Executive Committee together with the president and the officers of the Association.

The award will be made in connection with the XVIth Concilium Ophthalmologicum. Papers may be presented by any responsible research worker. The subject is to be "Simple non-inflammatory glaucoma" and may include anything definitely relative to the question. The matter must be new and of such value, in the judgment of the jury, as to merit this recognition. Papers may be written in English, French, German, or Italian; in order to facilitate the task of the jury, papers written in the last two languages should be accompanied by a translation in English or French. They should be in the hands of the secretary of the International Association for the Prevention of Blindness, 66 Boulevard Saint-Michel, Paris, through whom they will reach the members of the judicial committee, not later than six months before the date of the Congress. The decision of the jury will be final.

SOCIETIES

The twenty-fourth annual meeting of the International Medical Assembly, Inter-State Postgraduate Medical Association of North America, was held October 30 to November 3, 1939, in Chicago. Dr. Albert D. Ruedemann, Cleveland

Clinic, gave the Joseph Schneider Foundation presentation. His subject was "exophthalmos."

The North of England Ophthalmological Society held a slitlamp course, open to all ophthalmic surgeons, at Sheffield on September 25-29, 1939. Mr. Harrison Butler and Mr. Basil Graves were the lecturers.

The International Council of Ophthalmology met in London on April 19, 1939. Themes discussed were: 1. Plastic operations on the eyeball, 2. The pathology of retinal detachment, including the biology and pathology of the vitreous body.

The National Society for the Prevention of Blindness held its annual meeting in New York on October 26 to 28, 1939. The program included: Nursing as it relates to sight conservation; Sight conservation in industry; The doctor in conserving the sight in the pre-school child; Social work in preventing blindness; Sight-saving classes. A subscription dinner was held on two evenings of the meeting.

The following officers have been elected for the New York Society for Clinical Ophthalmology for the coming year: president, Dr. Arthur M. Yudkin; vice-president, Dr. Morris Davidson; recording secretary, Dr. Sidney Fox; corresponding secretary, Dr. Benjamin Esterman, 515 Park Avenue, New York; treasurer, Dr. Adolph Posner. Meetings are on the first Monday evening of each month, October through May.

The following program for the November 6th meeting of the Washington, D.C., Ophthalmological Society was given: Malignant melanoma, by Colonel G. R. Callender; Field changes following satisfactory filtration operation for glaucoma, by Dr. John W. Burke. Case presentations by Drs. E. Leonard Goodman, Joseph Dessoff, and Robert F. Costello.

PERSONALS

The Journal wishes to correct a personal news item in the October issue, in which it was stated that Dr. Karl Ascher, now associated with the Department of Ophthalmology of the University of Cincinnati, was the successor of Dr. Elschmig as head of the Department of Ophthalmology of the German University of Prague. Dr. Ascher was not Dr. Elschmig's successor but was professor extraordinarius, a position corresponding to that of associate professor in our country.

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